American Machinist

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Controlled Atmosphere—The Metal Show disclosed that heat-treating is becoming an exact science (page 1020).

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AMERICAN MACHINIST Helps to Build A CAREER

WHAT AMERICAN MACHINIST did for C. H. Ramsey it has also done for hundreds of successful manufacturers in the metal-working industry. The paper has been for 60 years, and is now, a vital part of the mechanical engineering educational system of the United States.

Mr. Ramsey took American Machinist with him through the long years of his career because it continually gave him actual, tangible help. He reads it today for the same reason. He says:

"It is a pleasure to acknowledge American Machinist's exceptional educational value to me.

"I have been reading American Machinist continuously for more than 35 years.

"Way back in the early 1900's, I found a great thrill in contributing to its pages and felt that I was in very good company.

"I still find American Machinist stimulating, and full of ideas for the better management of our business. I insist upon every issue going into our Engineering Department, and take pains to point out from time to time specific articles to our engineering staff for their study and use in connection with their work.

"Your advertisements, too, I consider highly instructive. Our buying decisions are unquestionably moulded to a considerable degree by reading the advertising pages."

C. H. RAMSEY
PRESIDENT
Morrison Machine Company
Paterson, New Jersey

Mr. Ramsey started in 1896 as a machinist's apprentice at John Royle & Sons, Paterson, N. J. He became successively journeyman machinist, draftsman, machine designer, superintendent.

His mechanical engineering education augmenting this practical experience was self-acquired through private tutoring, special instruction, correspondence courses, and reading of textbooks and American Machinist.

In 1913, he bought an interest in The Morrison Machine Co. of Paterson, then a young concern. Soon afterward, he became its president . . . has been ever since. Under him, the company has become prominent in the manufacture of textile machinery and power transmission equipment.

Mr. Ramsey has been a member of the American Society of Mechanical Engineers since 1920.

His personal efforts have contributed greatly to developing high-grade equipment for the Sanforizing process.

EDITORIAL

Back to '32?

STEADILY declining business for several months, followed by a sharp break in the stock market, raises the question in the mind of every industrialist: Are we going back to 1932?

It would take a brave prophet to answer this question, now that we have a federal administration that can move money values up and down to suit its own ideas. But, after all, economic laws have a way of prevailing over political meddlers.

Though economists have lost some standing with the average layman, we may as well take what comfort we can from their opinions of what is in store. They point out that banks are much stronger than in 1932 and that there is little likelihood of a repetition of the liquidation mania that destroyed deposits of $18,000,000,000 five years ago. Brokers' loans are but a tenth what they were then.

Commodity prices are off about twenty-five per cent from last spring, but are unlikely to reach 1932 levels because of support from the Sterling bloc, and because the United States dollar is no longer tied to gold. Farmers have discovered how potent they are politically, and are sure to use their power to prevent farm prices from going too low.

Wages were cut viciously in 1932. Is it reasonable to expect a similar slash now? Hardly, with a government friendly to labor, and labor unions several times stronger than at depression's bottom.

Railroad buying and domestic building are at 1932 levels now. They are unlikely to go any way but up. Purchasing power, measured by national income, is double what it was in 1932, and not likely to drop much. Inventories, up ten per cent, will be liquidated in three or four months.

AS FOR CAPITAL GOODS—production equipment and industrial buildings—the wise business head will take advantage of any price concessions offered in the next six to nine months. After that he is almost sure to have to pay a lot more. Training programs should be continued, else there will be a serious labor shortage next fall.

We are going rapidly out of a seller's into a buyer's market. That means agressive selling campaigns and the retirement of the order taker. Back to '32? We don't have to go back, nor are we likely to do so.

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Government's Part in Apprentice Training

Apprenticeship is an obligation that must be managed on a wide-coverage basis

WILLIAM F. PATTERSON
Secretary, Federal Committee on Apprentice Training

PRIOR TO 1934, when the Federal Committee on Apprentice Training was appointed, no national agency existed for the standardization of apprentice training programs. During the early months of its existence, employers in machinery and other industries cooperated only moderately, because they felt that F.C.A.T. was a temporary organization and would soon be discontinued. Such support as it received, however, enabled the committee to demonstrate that it could render valuable services. In fact, when the N.I.R.A. was declared unconstitutional in 1935, the committee was continued under the jurisdiction of the National Youth Administration because of these services. A little more than a year later, President Roosevelt directed that the committee be transferred to the Department of Labor, with a view to placing the work of the committee on a permanent basis.

Committee's Work Advisory

On August 16, 1937, the President signed the Fitzgerald bill, which makes this committee a permanent division of the Department of Labor. Congress has provided an operating fund of $61,000 in the third deficiency appropriation for the fiscal year 1938. Now, with apprenticeship standards assured as an important factor in industry, the committee's advisory staff is constantly consulting with companies, unions and state groups. The committee is not empowered to enforce apprenticeship standards, nor does it pretend to instruct employers in training methods.

Long ago, a few successful, forward-looking employers realized the need for a steady supply of skilled manpower and, accordingly, worked out their own apprentice training programs. Out of such experiences have been developed proved methods of training. The committee's job will be: first, to reduce that experience to its least common denominators or, in other words, to the best known training standards; second, not only to distribute but to "sell," if possible, the idea of apprenticeship and the standards to employers who need them; and third, to assist those employers, together with their employees and the labor unions involved, in organizing and conducting their apprenticeship training programs for the best interests of all concerned.

Cooperation Essential

The committee cannot and does not expect to do all of these things alone. Its work has required, and will always require, the many-sided cooperation of employers, employees, labor unions, state labor departments, the public, the Office of Education of the National Youth Administration and, of course, the Department of Labor. This cooperation has been and will continue to be forthcoming.

Not one opposing witness appeared at the Labor subcommittee hearings on the Fitzgerald bill and active support was given by all political parties and industrial interests. Among the witnesses giving their unreserved approval of the program in principle were: Socony-Vacuum Company, Associated General Contractors, National Association of Manufacturers, American Federation of Labor, American Federation of Hosiery Workers, many local and international unions, state labor departments and government agencies.

This approval by employers came after a few had at first resented the committee's activities as interference with their business. Now they see it as an effort to solve real problems that the entire country must face. For many years, large and progressive companies that train young men properly have been losing them to other employers who do no training at all. Apprenticeship is an obligation that must be carried by all, not a few, and it must be managed on a wide-coverage basis. The day of the small plant in which the owner could personally pass along the traditions of the trade to a handful of youngsters is past. Hundreds of workers are now involved in identical jobs. For this reason, technological advances from all parts of the nation and the world must be shown to apprentices.

Broad Standards Necessary

To know that a new man has given a number of years of experience to a certain trade is not enough, for apprenticeship has never before been standardized. One company may have been keeping young men on the same identical job for years, or it may have used obsolete methods. When men from such employers are confronted with different jobs and different machines, they are helpless. A man with a certificate for certain preparation under known and accepted standards, on the other hand, is a known value.

Workers trained under broad standards are necessary in these days of quick-shifting demands from one line of production to another. Jacks-of-all-trades are not to be encouraged, but men with some diversification of ability cost far less than the labor turnover that is necessary when one-job men are the rule.

Aside from the usual cycles of business activity which alternately

over-supply and under-supply the demand for skilled labor, there is the romantic appeal of new industries which destroys the balance. For example, there was first the demand for automobile mechanics and chauffeurs (remember those seductive ads?), then came the radio craze. Next in line was aviation and then diesel power, now it is refrigeration and air-conditioning. Such extreme surges of interest should be controlled.

An over-supply of skilled labor in one occupation usually means a shortage in some others; both the over-supply and the shortages, in many cases, affect the same employer. Apprentice standards will, in a large measure, adjust the supply to the probable demand.

Craftsmanship Has Waned

A man with trained mind and hands is still the most important unit in any plant or shop. However, the importation of European mechanics in past years, the glorification of machine power over manpower by writers and dramatists, and the lack of esteem for apprenticeship have seriously diminished pride in craftsmanship. In league with those trends was the great impulse to academic learning that filled the colleges after the war.

Now, with college men going to work for $25 a week while men who have learned a craft are getting more, it is realized that there is work for only a small percentage of the white-collar aspirants. Pride in craftsmanship is coming back, and the apprentice program is aimed to encourage it. The promotion road is as clear for the bench man as for the desk man.

Unions Give Support

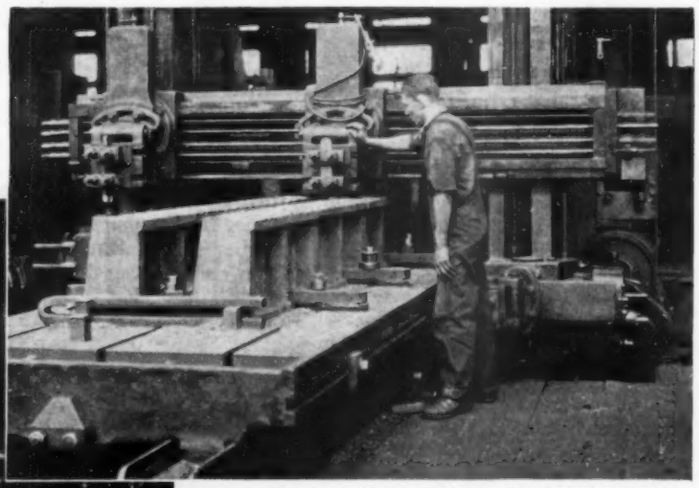
Labor unions are supporting the apprentice standards program because they, too, want to control the supply of skilled labor and thus keep the wage scale up. They, also, want to maintain pride in occupation and prestige for craftsmanship. Both the committee and the unions desire to develop skilled labor where and when it will be needed. It is realized, however, that a certain amount of journeying is a good thing; it distributes ideas, mixes new blood with old.

The advantages of apprentice standards to the workers are obvious and need no elaboration. This program does not pretend to serve the millions of unskilled workers. Theirs is another problem; they have other and able champions. The apprentice committee's realm is the 6,000,000 or so men who have devoted several years to the acquisition of a skill that has value. Security, for the skilled workers, while they earn more than others, still depends on steady employment, as well as upon their personal initiative. Steady work, through controlled supply, plus additional ability to earn, is what the standardization program is trying to help them achieve.

Basic recommended standards of apprentice training are three: (1) 144 hours a year or related instruction; (2) every apprentice should be under written agreement, otherwise the relation etween him he and the employer is merely haphazard; (3) the written agreement should be approved by a third responsible party. On this framework is developed a different structure to fit individual employers, worker groups and industrial regions.

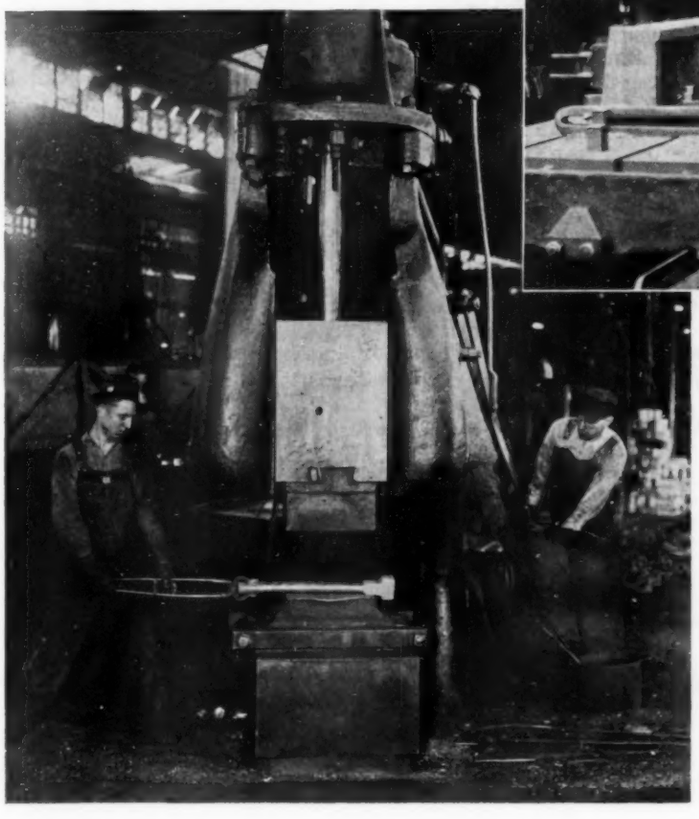
Suggestions Invited

Twelve hundred voluntary committees are now functioning in 45 states and advice based on the experience of the members of the committee, the labor department and these voluntary committees is available to those planning a standard program. The committee invites information and suggestions dealing with apprenticeship from all employers.



Courtesy of Allis-Chalmers Manufacturing Company

This apprentice, learning his trade under a well planned program, will have many opportunities not afforded untrained, unskilled workmen



Blacksmith and his apprentice helper operating an open-frame steam hammer; careful attention to the training program will mean much to this apprentice in later years

Improved Products Displayed at Metal Show

Advances in materials, heat-treatment, welding, testing, finishing processes and metal-cutting equipment are viewed by 11,000 visitors

ATLANTIC CITY, N. J. — Controlled atmospheres are the greatest single advance in heat-treating during the last few years. They are specified for practically all operations in which the work is surrounded by gaseous atmosphere. Necessarily, the material, temperature, fuel and time are important factors, and many ingenious controls have been worked out. Scale-free bright work has been possible for some time, particularly on steel tools, but some decarburization has also been experienced. Now that problem is practically solved.

Extremely large furnaces are now being built by Surface Combustion Corporation and The Electric Furnace Company, for continuous processing because of refinements and developments of the radiant tube. Like an electric conductor, the radiant tube can be made in long lengths, 60 to 70 ft. at present.

Close Control in Cyaniding

Dry cyaniding is another process made commercially feasible during the present year. The process is intended primarily for continuous production, is more flexible than wet cyaniding and the proportions of nitride and carbide can be controlled or adjusted within close limits.

Another important development is the growth of convection heating. Equipment outside of the furnace is used to burn the fuel—city gas, natural gas, propane or cracked oil—and to pass the products of combustion into the furnace chamber.

Substitution of air-cooled electrodes in electric furnaces for the water-cooled type saves expense, makes a more compact job, and raises the thermal efficiency of the furnace. Electric furnaces, as well as gas furnaces, are frequently operated with controlled atmosphere, but in most cases the controlled atmosphere is obtained from a separate equipment. Now an attachment is being built by C. I. Hayes, to go on standard furnaces.

Operators of heat-treating equipment could not fail to be impressed by the marked improvement in refractories and insulating materials displayed at the Metal Show. Combination of suitable refractories and improved insulating blocks now make possible much thinner and lighter furnace walls. Heat loss is far lower per inch of thickness.

The operating range of refractories is being raised by using denser materials. It is expected that the material zircon will be used in refractories for this purpose and allow still higher temperatures because the fusion point is over 4,000 F. Bentonite, a refractory clay is another material that will be used to give greater plasticity and smoother troweling.

Brown Instrument Company has supplemented its Air-O-Line of temperature control instruments by the Electro-Line type. This method of control substitutes electricity for the pneumatic arrangement and may be used on all automatic instruments either of the recording or indicating models. This concern also displayed its new Analy-Graph which tells the percentage of CO_2 gas in controlled atmosphere furnaces.

The use of multiple indicating pyrometers was exemplified by the T. J. Tagliabue Manufacturing Company's new high speed multiple potentiometer recorder. This instrument may be arranged to read up to twelve stations. It will record six points distributed over the entire chart in less than 1 min.

An improvement on its Micromax control system shown by Leeds & Northrup is its infinite position control. This device operates on the Wheatstone bridge principle by means of a slide wire which balances with the setting on the control instrument.

Bristol's Pyromaster is a new recording and indicating potentiometer with no continuously moving parts. There is no mechanical connection between the various parts of the instrument, and it is claimed that the device is not affected by vibration.

No Fuel Without Flame

Proportioning control was incorporated in the instruments displayed by Wheelco Instruments Company. The principal of this device is the gradual opening or closing of the control throttle to prevent overshooting. The Flamatrol, also demonstrated by Wheelco, shuts off the supply of gas or oil fuel in case the flame is accidentally extinguished.

The Foxboro Company featured throttling furnace control in a potentiometer instrument. This electrically operated device has a slide wire control circuit which moves the fuel valve gradually rather than abruptly.

New developments in gas cutting equipment are for flame cutting and flame hardening. Cutting by means of the oxyacetylene flame has increased in range and in the accuracy with which shape can be produced.

Air Reduction Sales Company displayed the largest gas cutting machine ever produced in its new No. 20 Travograph which is capable of taking sheets ten feet wide. The machine at the show had an eleven foot capacity in length, but this may be increased by simply lengthening the tracks. The Travograph may be operated manually or by means of a

mechanical templet. The same concern showed the No. 10 Radiagraph, a new size of this convenient equipment for straight line and circle cutting. Another machine in this exhibit is the Airco circle cutting machine which has a capacity from zero to 24 in. in diameter.

Linde Air Products improved Oxweld cutting machine will form straight lines and circles automatically and irregular shapes by hand. This company also featured flame hardening machines, both for gears and flat surfaces, either vertical or horizontal. Linde's new line of regulators covers the entire welding and cutting range in three sizes where formerly four to six were required.

Quicker Set-Up For Cutting

In its new shape-cutting machine the National Cylinder Gas Company claims to have reduced set-up time. The torches are fed along an arm supported by a cross section and can travel to any point in the plate being cut. The machine has remote control of both flame and torch positions. A National flame-hardening machine for use on gears is operated by a mechanical motor.

Arc welding equipment on display gave evidence of greatly improved control making welds that are both greater in strength and neater in appearance. Equipment is becoming more specialized for quantity production work, but at the same time some units feature greater flexibility to fill a range of service for the job shop.

Westinghouse has made a number of refinements in its Flexarc welding equipment. A small snap switch is now available to reverse polarity. This concern also offers a new garage a.c. welder for light repair work.

The Lincoln Electric Company had a display of the kinds of work to which arc welding is suited. Such parts as automobile starter frames, axle housings and refrigerator unit casings gave evidence of the wide application of automatic arc welding.

General Electric displayed a new portable unit mounted on a trailer and driven by a V-8 motor. In the same exhibit were a new 150-amp. d.c. horizontal motor generator welder and a 150-amp. a.c. transformer type unit. An improved atomic hydrogen welder included infinitely variable current control and a fully inclosed unit.

A feature of the Wilson Welder and Metal Company's exhibit was its Yellow Jacket pipe line welding machine. This compact unit was short coupled and driven by a Buda engine. The frame has been lightened and the center of gravity lowered. An improved idling device automatically slows down the engine when the welder is not in use.

The Electric Arc Cutting and Welding Company showed a multiple arc a.c. transformer which could be used for a number of stations distributed about the plant. This concern also displayed a diesel driven generator unit. Harnischfeger showed a single control Smootharc model which is furnished in two, three, four, five and six hundred ampere sizes.

Carburizing and dry cyaniding occupied a good share of the A.S.M. program this year. Left to right—S. L. Widrig, Spicer Manufacturing Company; E. G. de Coriolis, Surface Combustion Corporation; E. F. Davis, Warner Gear Division, Borg-Warner Corporation; H. W. McQuaid, Republic Steel Corporation, and R. J. Cowan, Surface Combustion. Messrs. Widrig, Davis and McQuaid were among those that discussed carburizing.

The Owen Electric Sales Company featured a universal arc welding machine which is said to be capable of handling both large and small rods on ferrous and non-ferrous materials.

The trend in welding rods seems to be in the direction of reducing the number of varieties required. This is being done by a study of the coatings in order to make their desirable characteristics available with fewer types. At present a wide variety of rods still seems to be needed. In fact, some concerns specialize in limited divisions of the arc-welding field as does the Arcos Corporation which confines its attention chiefly to stainless and non-ferrous applications.

Resistance welding, although not so much in evidence at the show as arc welding showed that similar strides are being made in its developments. In the Westinghouse booth, the Taylor-Winfield Company displayed a seam welder controlled by an improved panel which calibrates the current in a per cent of maximum, ranging from 20 to 100 per cent in continuous steps. This panel is of the electronic tube type.

Strides in Spot Welding

A wide variety of spot welding machines was shown by the Eisler Engineering Company. The Taylor Hall Welding Corporation showed a new spot welder in which the upper horn moves vertically instead of rocking. The foot-operated control is so arranged that full pressure must be on before the circuit is closed.

Greater flexibility in resistance welding is obtained by the American Coach and Body Company's equipment known as Flexi-Weld. In this method the work piece is grounded and flexible water cooled inclosed cables are attached to a welding tip which may be carried to inaccessible portions of the work.

The Metals Coating Company of America showed a new metal-spraying head which is capable of applying 2½ times as much metal as the previous design. This unit will handle wire sizes from 20 gage up to ⅛ in.

Higher prices of tungsten because of the recent war troubles in the Far East have caused a definite swing to the use of molybdenum in tool steels. Many companies are now pushing their molybdenum line.

United Carbide and Carbon Corporation was showing a new product, Haynes Stellite-2400. Eventually it is planned to replace the present J-Metal with the 2400 Metal. This new material is claimed to give 10 to 50 per cent increase in cutting speed over the J-Metal and at the

same time has a somewhat longer life.

Beryllium copper was in evidence in several booths made up in the form of tools. The non-sparking safety feature of these tools is being played up, and it was claimed by one company that Brinell hardness of over 200 could be attained with this material. Riverside Copper Company is expanding the uses of this material in the electrical and other small parts manufacturing field.

Ampco had on exhibit a great number of complicated centrifugal castings such as blanks for gears and pulleys. This company has recently developed Tordaloy Nos. 1 and 7 for the General Electric Company. These copper alloys are designed with great hardness combined with good electrical conductivity for welding wheels.

Screw Stock Cuts Readily

The Aluminum Company of America was exhibiting Alco 11S-T3. This material is designed for screw stock use and demonstrations made at the show indicate that it can be cut readily.

A. Milne & Company exhibited a new method of bar identification. The full length of the rods are colored so that there is never any danger of taking one steel for another.

Two companies devoted their entire space to furthering the plans which they have recently announced with regard to their products. Joseph T. Ryerson & Son devoted their booth to the new Ryerson certified plan. Dohler devoted its booth to announcement and demonstration of its work in magnesium die castings.

Michigan Steel Casting Company showed a stainless steel or heat-resisting alloy conveyor roll made by flash welding stationary cast journals to a centrifugally cast tube. The American Metal Hose Branch of the American Brass Company displayed flexible copper tubing in a form which was referred to as vibration eliminators.

Several companies exhibited composite steels. Jessop Steel demonstrated a composite die section. These composite sections are manufactured by rolling high grade steels in the same bar with phosphorous steels. Originally designed for use of automobile manufacturers in cutting dies, this material is now being made up in various other forms for other types of cutting tools.

Machine exhibits included both foreign and domestic makes, mostly for special purpose work, such as the engraving and die sinking machines by Marburg Brothers and Preis Engraving Machine Company. There were several types of cutting-off machines both band and hack saw as well as applications of abrasive wheels. These included Andrew C. Campbell, Victor, Wells Mfg. Company and A. P. de Sanno & Son. Bandsaws for die work also attracted attention at the booths of Continental Machine Specialties and Grob Brothers.

Cutting tools of the various new alloys as well as the application of these alloys to special uses, where resistance to corrosion, or abrasion, or both, are important factors, indicates the fields into which these metals are expanding. The Carboloy Company, Firthite, Halcomb Company, Haynes Stellite and Ludlum tools were shown. Even the file, one of our oldest tools, has undergone improvement in the matter of special teeth for different purposes, such as a "non-cloggable" file for aluminum. Both Henry Disston & Sons, Inc. and Heller Bros. had interesting exhibits.

New apparatus for cleaning metals, both by sand or shot blasting, developed to use centrifugal shot throwers instead of an air blast, was shown by American Foundry Equipment Company and the Pangborn Corporation. Chemical methods of cleaning finished surfaces from oil or grease has also developed by G. S. Blakeslee & Company and others into a considerable business for quantity production work. The effect of coolants on different materials has been studied to advantage by the D. A. Stuart Company.

Attention to Rust

Rust preventives have also received attention to combine protection and easy removal in the same material. Some must present a fairly hard surface while for use on bright work that is stored in quantity the material must flow easily and cover any surface exposed by contact between parts. Interesting examples of this were shown by the Alox Corporation.

Improvements on abrasive wheels, both for cutting off and for finishing, were in evidence. Examples of these were shown by Carborundum, Macklin, Manhattan Rubber and Norton. The thin flexible wheels, with rubber or other non-rigid bond, was shown on machines of different types. Machines for grinding and polishing with abrasive belts were also exhibited by the Production Machine Co.

One of the striking advantages of the stronger steel alloys is in the making of wrenches. The Bonney Forge & Tool Company exhibited wrench forgings so thin as to appear almost like sheet metal for inaccessible places.

New automatic spring making machines by Sleeper & Hartley and the Torrington Company are remarkably versatile as to the kind of springs that can be produced. The Weidemann turret punch was also shown.

Baldwin-Southwark Corporation exhibited its new electro-magnetic fatigue testing machine, Rayflex. A General Electric Strobotac is now being used in conjunction with this to slow down the movement of the bar so that the eye can follow the growth of fatigue tracks.

Of interest to the inspection and manufacturing field was the new Bausch & Lomb contour measuring projector. An optical system has been devised so that magnification is the same all over the screen.

Krouse Fatigue Machine Company was demonstrating its high speed rotating beam fatigue machine which is a self-contained cantilever rotating beam having a speed range of 500 to 12,000 r.p.m. The calibrated weight beam is inclosed within the machine base.

Indicator Is Versatile

An indicator dial of special interest to tool makers is the Federal Model 1, graduated to 0.001 in., and the Model 2, graduated to 0.0001 in. This small dial is provided with a special attachment which makes it easy to use as a surface gage, height gage or in tool posts.

Tinius Olsen Testing Machine Company showed a new automatic ductility tester.

An interesting trend which was noticeable in the testing machine division was that of speeding up test work for production purposes. This was particularly noticeable in the development of hardness testers. Speeding up of hardness testing has been caused by the demands of automotive production and several companies have produced production line hardness readers. The Pyro-Electric Instrument Company showed a foot pedal operated, motor-driven rotary gear type pump and oil pressure hardness testing machine which was capable of averaging 1,800 tests per hour. The Detroit Testing Machine Company also had high speed Brinell testers, one of which is intended for compressible products. Metlab Company showed a portable hardness tester.

Stanley T. Rockwell Company displayed its quenching Dilatometer for the first time. This device was used to check the change in characteristics and dimensions of material while undergoing a quenching cycle.

More Goods for More People

How machine tools and the machine tool builders have contributed to the general welfare and why they have been unable to do more

CLAYTON R. BURT
President, Niles-Bement-Pond Company

THE GREAT OBJECTIVE of the machine tool industry, the objective to which all of the engineers and designers, executives and operators are striving to accomplish is the extension of that general well-being that is so concisely expressed in the phrase "More Goods for More People." That objective inspires the efforts to furnish industry with more accurate and more productive equipment. It is an objective that may well command universal respect. It is one that has a broad background of success, for every scrap of evidence available proves that the development of production, transportation and communication to their present highly mechanized state has been accompanied by a steady growth in employment and a richer, more abundant life for the masses of the people. That objective expresses our interest, as machine tool builders, in the welfare and prosperity of all lines of industry, because every industry from its inception depends upon the services of machine tools.

Moreover, the steady flow of more goods and better goods to an evergrowing population is, as it should be, the avowed aim of the administration at Washington. Most of the experimental legislation that causes us so much anxiety has been imposed in the name of this ideal. The difficulty is that Washington has some novel plans, yet unproven, regarding the distribution of goods to more people, but has neglected the important point that there must also be more goods produced if the distribution is to be permanently effective.

It is apparent that a very important requisite has been overlooked, namely: understanding and appreciation on the part of the government of the problems of industrial management. Our great social structure has become so complicated that it is vitally necessary for industry to cooperate with the administration, and this we have faithfully tried to do. It is quite as necessary for all branches of the government to cooperate with the managers of industry. That has not been done, and persistence in this course is dangerous.

We are disturbed by the current recession of business, which is occurring in spite of the known shortages of housing, foodstuffs, materials and equipment. To replenish these needs should keep all of our industries running at full capacity. In machine tools alone, we know that our customers have scarcely begun to replace the old equipment that is no longer giving efficient service. No one can blame executives or managers for the cautious policy that they find it necessary to adopt, but we regret that the aggregate of production in many lines is less than is actually needed to supply the wants of the whole people at prices they are able to pay.

Tax on Undistributed Earnings

As one example of misdirection on the part of the government, due to a lack of comprehensive understanding of industry's financial problems, I cite the Tax on Undistributed Surplus laid upon corporations by the 1936 Revenue Act. The acknowledged purpose is to force a distribution of earnings, as well as to provide revenue to the government. It is based upon a misconception of the term "Profits" which leads its proponents to consider all income in excess of current expenses as available for dividends or taxes, and to look with suspicion upon reserves.

This particular legislation, if continued will defeat the aims of the administration in several directions, not the least among them the stabilization of production and employment, which is so vital to prosperity. Those who were responsible for this law were not fully informed of the importance of corporation reserves to the country during the bad years of 1930 to 1934. During these years, while the government spent 8 billions of dollars in an effort to restore a normal balance, corporations spent over 18 billion dollars more than they received. To do this they not only had to have a surplus on hand, but that surplus had to be readily available in cash or quick assets; not tied up in buildings nor frozen in finished goods for which there was no market.

In the machine tool industry most companies retained a nucleus of skilled workmen at all kinds of odd jobs throughout the depression, so that they would be available immediately upon resumption of operations as a result of an improvement in business. In this industry, as well as in many others, research, redesign and development of new products provided work for a sizable staff while business was dull. At no time during these years did employment fall as low as the indexes of production.

Research and design during a depression period require a substantial amount of money, and it takes courage to spend money in excess of income at a time when it is impossible to see what the next day will bring forth. The estimated loss in capital and surplus of the machine tool industry during the de-

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Abstracts from the presidential address at the October 25 meeting of the National Machine Tool Builders' Association, Hot Springs, Va.

pression, based on an Association study, amounted to between 35 and 40 per cent of the financial strength of the industry.

Any conservative executive considers it his first duty to restore his depleted cash reserves when business returns, in order that his company may be prepared to face the next emergency. The surplus tax provision, by making this almost impossible, places a heavy penalty on industries like our own, where earnings not distributed to stockholders are appropriated by the government in the form of taxes, and these earnings are lost as a backlog for the industry. Its financial position must then be gaged purely on current business. Its credit will fluctuate with the volume of orders, or lack of them. Without means to finance employment in dull times, its employees will suffer the same risks as the stockholders. No orders, no work, no dividends and no purchasing power. The possibilities that this surplus earnings tax carries for hastening and prolonging depressions are appalling and certainly were not taken into consideration by the authors of the Bill which was so hastily put through to become a law.

To furnish more goods to more people, with our increasing population, industry must expand. The normal growth of a corporation is ordinarily financed out of surplus. We are now told that industrial expansion should be paid for by the sale of new securities. Large companies can sell bonds at a moderate cost, approximately 10 per cent. Small companies must sell common stock, and the cost is about 15 per cent. The large corporation with a national reputation can easily find a market for its securities. It is extremely difficult for the small and practically unknown concern to raise capital in this way.

Fortunately, there is evidence that even the proponents of this legislation are beginning to see that it is unworkable, and revision of the 1936 Revenue Act is likely. It is our duty to see that congressmen are better informed when that revision is under consideration than they apparently were last fall.

Increase in Tax Burden

Another matter of deep concern to every American business man is the constant increase in government expenditures and the apparent inability of government to come appreciably near to a balanced budget. We are all familiar with the fact that the national debt is now 37 billion dollars. We are not as conscious of the tremendous aggregate of state debts, amounting in 1936 to a total of 3 billion dollars. To this must be added the accumulated debts of smaller political subdivisions. The figures are so large as to challenge our understanding. It may mean more to say that each family in the country must assume as its average share a debt of $1,700.

In 1890 corporations paid 5 per cent of their income in taxes to the national government. While some of their earnings went to stockholders, a substantial portion was set aside for the replacement of obsolete equipment and for the revamping of manufacturing facilities as new needs developed. It is from this source that we derived the remarkable expansion of American industry from 1900 until the present day, with a consequent increase in employment from 29 million to 45 million workers. The policy of taxing heavily the earnings of corporations discourages this reinvestment of funds and is a powerful force tending to crystallize industrial enterprise at a capacity less than is necessary to keep abreast with the natural growth of the population.

Rising Costs of Production

Rising labor costs, without commensurate increases in labor efficiency, likewise constitute a restriction on production. A constantly increasing proportion of the dollar received by the manufacturer is going into the payrolls of his workers. It has frequently been pointed out that labor is only one element in cost, and that a 10 per cent increase in your payroll might mean only an increase of 2.4 per cent in the cost of the finished product. When, however, increases in wage rates take place not only in your factory but in the plants of those who supply you, in mines, in transportation, and in factories in every field of industry, the general tendency to increase wages is reflected in everything you buy and in every element of cost; not merely in your payrolls. In 1936, 66.5 per cent of the national income went to labor.

We are not opposed to increased wages. We believe in so improving the efficiency of industry as to increase the output per man employed, thereby making higher wages possible. We are opposed to arbitrary increases by legislative measures. Such increases are unsound—they cannot be maintained and only benefit a few at the cost of other workers not equally favored. They inevitably cause higher prices and decreased consumption.

The next session of Congress will be called upon to push a bill providing for minimum wages and maximum hours of labor; these to be fixed by a national board, politically appointed. What the outcome of such legislation will be remains to be seen, but one certain result will be the further extension of administration costs, which likewise must be met by further calls upon the corporations of the country for more taxes, causing further increases in the cost of production.

The re-establishment of a trend toward a balanced Federal Budget, the withdrawal of restrictive taxation and the abandonment of impractical attempts at national planning would be immediately reflected in stabilized business, pushing forward with confidence to the common goal we are all striving for—Happiness and Prosperity.

Man Power and Machine Tools

A. C. DANEKIND

Chairman, Factory Equipment and Practice Committee
General Electric Company

UP TO A comparatively few years ago, human equation or man-power problems, if there were any, in industrial concerns were centered about self-contained and highly skilled craftsmen of the thorough, leisurely type. These men depended on their all-around skill in their daily tasks, proud of the opportunity of building their individual personalities into parts they produced, and all this with the help of the foremen or even more experienced bench mates. Specialization of effort and skill was unheard of, probably for the reason that existing machine tool equipment generally lacked refinements to produce a fin-

ished product to the required standard of perfection. No particular incentive was shown by management for a constantly improved product at lower costs, and as a result, the lot of the skilled craftsmen, and the machine tool builder as well, even in view of ups and downs in business cycles, was a reasonably happy and complacent one.

About ten years ago, however, a simple announcement was made by a prominent automobile manufacturer which has had a more profound effect on the relationship of man-power to machine operation than any single event in the history of industrial development. I refer, of course, to the Ford Motor Company's expressed intentions of forsaking at that time the production of Model "T" cars in favor of a newly-conceived creation—the Model "A."

The announced change-over from one model to another was not in itself particularly unusual, since most automobile manufacturers, even in those days, made it a practice to bring out new models just about yearly. The truly significant point in connection with the introduction of the Model "A" was Mr. Ford's public announcement to the effect that all machined parts were to be produced to working tolerances which were, at that time, generally considered as being unnecessarily close, and which, it was felt by all of us, could only be maintained by highly skilled mechanics at prohibitive costs.

Responsibility for Accuracy

The motive behind the new model was to have it generally accepted as the best made and cheapest car on the market. It was designed and planned for manufacture with machine tool requirements and small tool and gage requirements as well, being established at an unheard of standard of refinement. The machine tool manufacturers were pressed for equipment which had to be far more accurate and dependable in its operation than anything designed and built up to that time. Furthermore, your machine tools were expected to be simple to operate.

Thus, for the first time in industrial history, the responsibility for maintaining required accuracy in machined parts was transferred on a large scale from Man-power to Machine Tools.

It is undoubtedly true, as reported, that the automotive industry lost many millions of dollars before the suppliers of machine tools succeeded in designing and building equipment that would permit the rapid production of parts to extremely close limits and without abnormally high spoilage losses.

There is no denying the fact, in my opinion, that the Ford Company's exacting requirements for machine tools for producing Model "A" car parts has definitely and completely changed and broadened the viewpoint of machine tool builders as to what constitutes adequate, efficient equipment. Consequently, all users of manufacturing equipment have been affected in no small measure by Mr. Ford's expensive pioneering efforts.

Industry generally has recognized the significance and importance of the evolution which took place in the operation of automobile concerns. The story of the automobile industry has since become the story of all other basic industries. The theory has been generally accepted by industrial management that a better quality of product at reduced selling prices should result in a healthy and favorable competitive position for any industrial concern.

Worker's Attitude Changed

Management's responsibility, as a result of the changed conception of relationship between man-power and machine operation has been to establish an adequate and fair evaluation of the comparative skill required to operate each basic type of machine as expressed in hourly wages. In other words, the *job* or *machine*, and *not the man's skill* has come to be evaluated.

No wonder then that man-power has slowly but steadily developed a different mental complex toward his job than the highly skilled mechanic of the slow, leisurely type who took so much pride in the part his all-around skill played in the parts he produced!

As long as business levels remained at a high standard, with plenty of jobs available, man-power remained reasonably satisfied, and not until business started to fall off in 1930, and reached such low depths in 1932 and 1933, did man-power really become concerned. We are now well out of the depression, but with increased business on every hand, man-power is obviously not the complacent factor it was prior to the depression.

What has happened to managers, workers and the entire man-power of industrial concerns during the past few years? Probably the most fundamental change in the man situation has been created by the education men have received. Throughout every organization man-power has been exposed, and has exposed itself, as a matter of fact, to a veritable barrage of fact, opinion and theory, which has run the course from forms of corporate organization to the individual's rightful share in profits. This barrage of opinions, proposals from government, from business organizations, from labor unions, and from individual proponents of fantastic schemes have reached the entire man-power of the country through the medium of radio, newspaper and mass-meeting, as well as from sources much less direct.

Management's Problem

For an executive to feel, as once he could with complete complacency, that his men were with him, so to speak, and consequently he need not be concerned as to the effect on them of this hodge-podge of thought, is, frankly, a refusal to face facts. The new conception of men as to their privileges and their responsibilities, which has been a concomitant of the New Deal in Washington, is the biggest single problem in management today. A true inventory of man-power will reveal new and radically different man-attitudes as compared to those of but a few years ago.

Management is generally committed to the philosophy of producing a better quality of product at reduced costs, and by so doing it hopes to broaden a given market and thus enjoy an increased volume of business. In other words, more goods, for more people, for less money. To do this means that every advantage must be taken of machine tools which will transfer an ever increasing portion of human skill from the job. It is vital that the job or machine and not the man's skill be adequately evaluated, and as man-power seeks a greater return for effort, so must industrial management press for machine tools which will reduce labor costs. The two subjects—man-power and machinery—are so closely allied, they cannot be treated separately, and together they represent the reason why, in my opinion, management's yardstick for appraising the value of a machine tool must be more exacting than ever before.

Abstracted from an address before the October 25 meeting of the National Machine Tool Builders' Association, Hot Springs, Va.

Smallest Car Built in Small Plant

Successor to the Austin, the Bantam "60" is being made in a 300 x 1,000-ft. building, and engine-building operations are being done entirely on standard machine tools

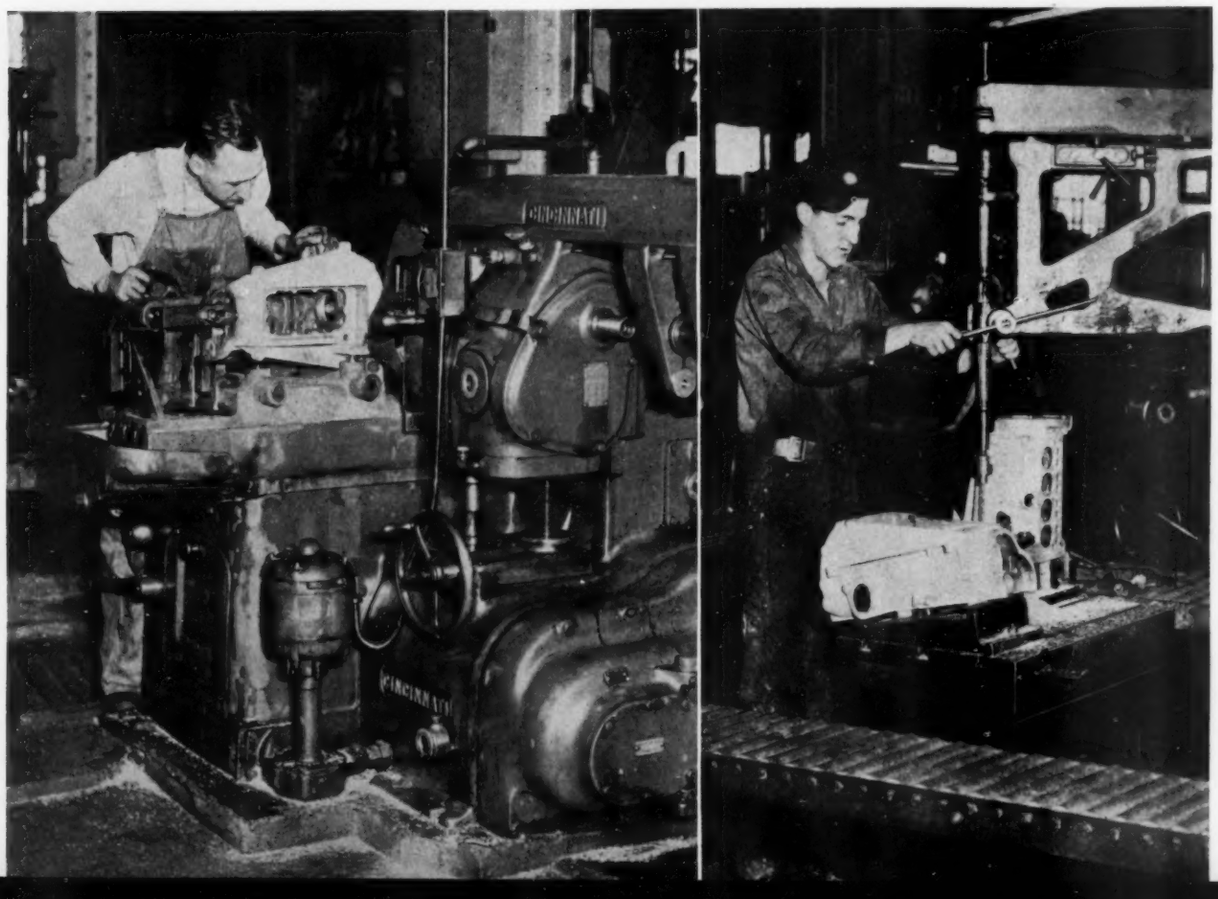
H. R. LE GRAND
Assistant Editor, American Machinist

BUTLER, PA., has built the largest and smallest cars in American automotive history. Shortly after the World War it was the home of the Standard, a model that lasted only a few months because of its size and cost. Now in the same plant the smallest and lowest-priced model in current production is getting under way. It is the Bantam "60," a complete redesign of the former Austin, but being manufactured by an entirely new concern, the American Bantam Car Company. A $400 delivered price range has been set.

The "60" gets its name from a reputed gasoline economy of 60 miles to the gallon. The wheelbase is 75 in., over-all length 120 in., weight 1,200 lb., and top speed, 60 miles per hour. Models will include a coupe, roadster, ¼-ton panel and pickup trucks. Power is furnished by a new 20-hp. four-cylinder engine with a 2.2-in. bore and a 3-in. stroke. An unusually high proportion of the motor is made of aluminum. This metal is specified for the crankcase, pistons, cylinder head and various small brackets and parts.

American Bantam bought the Austin property after action had been taken under Section 77D to protect the creditors. The equipment was installed new in 1930 by Austin according to recommendations of tool engineers that standard machines, rather than special-purpose machines, would best serve production needs. Retool-

Left, bulkiest part of the engine, the aluminum crankcase gets its first machining operation on a standard milling machine. *Right,* each of several Hammond radials does several drilling or tapping operations on the crankcase. In this case, two fixtures enable the operator to do a large number of holes at one station



Diminutive cylinder blocks are machined for the most part on standard milling machines and upright drills with simple jigs or fixtures

ing has involved new jigs and fixtures for the engine line. This work has been done in the past few months and operators are being trained in plant methods. There will be no attempt to build large banks of finished parts. Various feeder lines to the main assembly line will be operated only enough to care for daily needs. Eventually, a small number of completed cars will be kept in storage to meet the orders for a particular model without delay.

Many Parts Purchased

Manufacturing operations are carried along in a 300 x 1,000 ft. building, consisting of a main floor for engine and chassis work, and an overhead gallery along which body assembly, painting and trim installation are done. Straight-line production prevails. Spur tracks run along both sides of the building for receipt of material and shipment of finished cars.

Machining is limited to the main engine components such as the aluminum crankcase, cast-iron timing gears, gray-iron block, special aluminum pistons, connecting rods and flywheel. Crankshaft, camshaft, transmission, rear axle and drive shaft are purchased. Each of the machining lines is comparatively short. They start at the receiving platform along one side of the building and work across to the engine assembly line. This line is only about 300 ft. long and terminates at the test stands. The handling problem in the engine department is taken care of with short stretches of inclined roller conveyor or inclined chutes.

Beyond the engine test stands is the frame assembly and chassis assembly. Side rails for the frame are bought, but the smaller X-members, gussets and brackets are made in the adjoining press department. A considerable amount of press work is also done for outside manufacturers.

The front frame cross member is of forged steel and combines several functions in one piece: to tie the side rails together, to act as a spring perch, to support the wheels and the radiator. It requires a number of drilling and tapping operations which are done directly at the frame assembly. Gun welders join the sheet-metal frame parts set up in conventional jigs. After installation of running gear and motor the chassis is moved along on a conveyor to meet the body and motor.

No Premium Plan

Production plans call for 12,000 Bantam 60's the first year. The present daily rate is approaching 36 cars per day which is not sufficient to achieve the desired goal. However, the equipment is there to turn out a greater number when enough operators are broken in. Less than 100 men are now working on engine components and sometimes only a few are working on a given feeder line. For example, three men are expected to turn out 36 finished crankcases per day, doing all the operations in steps. Gages are put right at the machine so that the operators can check the accuracy when necessary before proceeding with the next operation. An inspection force is being built up, but for the present the shop management

When the crankcase reaches the starting end of the engine assembly conveyor, the bearings, camshaft, crankshaft and timing gears are installed

must exercise extremely close supervision of the men to achieve desired results. The men are on a straight-time basis and there is no incentive for them to skimp. Their sole job is to see that a given number of acceptable pieces get to the assembly line each day.

As stated previously, entirely standard machine tools with simple tooling are used for building engine components. Parts such as the crankcase and the block are rough milled, and then location holes are drilled. These holes are used in subsequent operations to register the piece over dowel pins in the fixture. If a group of small holes is to be drilled in one side of the engine, usually only that group is done at once on an upright machine. There is no attempt to use special machines that drill and tap from several sides of the block.

One of the high spots of the cylinder block and crankcase lines is the use of Hammond radial drills for drilling, reaming and tapping operations. The tool is readily swung into

Crankcase Operations

1. Spray interior with paint to seal the pores.
2. Face mill bottom on a Cincinnati Hydromatic.
3. Drill and ream two locating holes for subsequent operations, using a Cincinnati-Bickford upright drill.
4. Rough face the cylinder block pad on a Cincinnati Hydromatic.
5. Straddle mill the ends on a Cincinnati duplex.
6. Face the starter housing pad on a Milwaukee miller.
7. Line bore the camshaft and crankshaft bearing seats on a Barnes double-end horizontal machine. This is the first of three such operations. Removable split bearings go in these seats.
8. Face and chamfer the rear main bearing bore on the outside of the crankcase, using a Barnes upright drill.
9. Semi-finish bore the camshaft and crankshaft bearing seats in a Barnes double-end machine.
10. Gun drill the oil distributing gallery running lengthwise of the crankcase. Drill from both ends on a Barnes horizontal machine.
11. Drill the oil-filler tube hole, ream and chamfer on a Cincinnati-Bickford upright.
12. Drill and chamfer the hole for the oil-level gage on one motor-driven head of an Aveymatic machine. Drill the oil-relief hole for the rear main bearing on the other head.
13. Drill eight holes for the valve tappet guides and four holes in the crankcase to match the cylinder bores using a Barnes upright drill and a two-station fixture.
14. Drill and ream aligning holes in two bosses for the oil-pump drive shaft. This is done on an Avey double-end machine and a combination drill and reamer is used.
15. Enlarge the hole in the upper boss to take a bushing. Use a combination drill and countersink on a Leland-Gifford drill.
16. Spot face the pump seat on an Avey upright, using a piloted tool.
17. Gang drill the small holes in the front and back ends, ten in the front and fourteen in the back on a Barnes horizontal opposed machine.
18. Gang drill thirteen holes in the top face and twelve holes in the bottom face on a Barnes horizontal opposed drill.
19. Drill fourteen holes on the bottom for the oil pan, using a Barnes upright drill and a multiple-spindle head.
20. Tap eight stud holes on a Hammond radial drill. Also drill and tap two holes in the starter pad.
21. On a Hammond radial tap fifteen holes on the clutch end of the crankcase; turn the crankcase end for end and tap ten holes in the timing gear case; also drill an oil-return hole using a removable bushing plate that locates from previously drilled holes.
22. Drill two holes about ¾-in. deep on a Hammond radial. Drill another hole several inches deep from the oil gallery to the camshaft rear bearing. Tap the oil-screen holes in the bottom. Tap a ¼-in. pipe size hole in one of the oil-gallery cross holes and plug it.
23. On a Hammond radial drill tap three holes in the side of the oil gallery.
24. Drill and spot face holes in the motor supports on a Leland-Gifford upright.
25. Set crankcase in Lodge & Shipley 14-in. lathe; take a finish cut on the flywheel bell housing face and clean up on the inside of the rim for flywheel clearance; finish face the rear main bearing.
26. Finish mill the top pad for the cylinder block on a Cincinnati vertical miller.
27. Finish spot face the rear of the camshaft bearing on a Whitney hand miller.
28. Finish line bore the two crankcase main bearing seats and the three camshaft bearing seats on a Barnes double-end machine.
29. Hand ream the camshaft bearing seats, using shell reamers on a bar.
30. Hand ream the lower hole for the oil-pump and ream the bushing in the upper boss for the pump drive shaft.
31. Spot face and chamfer by hand the surface for the oil pump gasket.
32. Wash, blow out chips and inspect.

Cylinder-Block Operations

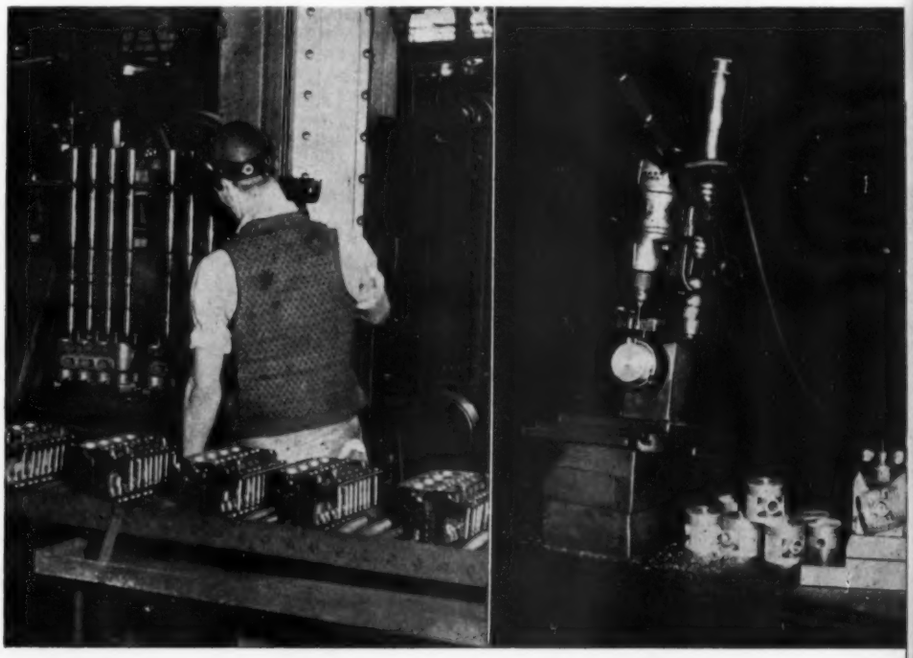
1. Rough mill the bottom and top on a Cincinnati No. 3-30 Hydromatic. Locate from the inside edge of the flange resting on foundry points.
2. Finish mill the bottom and top, locating from the previously milled surface, employing two fixtures.
3. Drill and ream two locating holes using a 21-in. upright drill with a two-spindle head.
4. Counterbore the two locating holes.
5. Mill the manifold, face the valve cover, face the water inlet on a Cincinnati No. 3-30 Hydromatic with two fixtures. Use a gage to check the relation of the valve cover and manifold faces with the dowel holes.
6. Rough bore four cylinder bores, locating from the two locating holes. Use a two-spindle multiple head and index the boring fixture.
7. Core drill and counterbore for Welch plugs, using an indexing fixture. A plug gage is used to check the counterbore.
8. Drive in the Welch plugs.
9. Water test.
10. Semi-finish four cylinder bores, again using a two-spindle multiple head and an indexing fixture on a 24-in. upright drill.
11. Chamfer the cylinder bores, locating from the semi-finished bores. Use a No. 210 Barnes drill press with a four-spindle multiple head.
12. Rough core drill the valve throats, using a 24-in. drill press and an eight-spindle multiple head.
13. Drill eight valve stem guide holes on a 24-in. upright drill using an eight-spindle head and fixture.
14. Semi-finish ream eight valve guide holes, leaving 0.006 in. for size reaming. This operation is done on a 24-in. drill press with an eight-spindle multiple head.
15. Rough ream the valve throat holes using a piloted reamer on an eight-spindle, multiple-head drill press.
16. Drill tappet guide holes on a 24-in. upright having an eight-spindle multiple head.
17. Semi-finish, align ream the tappet holes, leaving 0.006 in. for size reaming. A 24-in. drill press with an eight-spindle head is used, and the holes are checked with an alignment plug.
18. Spot face spring seats on a drill press, using an eight-spindle head and a counterboring fixture.
19. Counterbore and chamfer the tappet holes, using an indexing fixture on a 24-in. drill press with a four-spindle head. Combination counterboring and chamfering cutters with pilots are used. The depth is checked with a gage.
20. Size ream tappet holes on a drill press, using taper fluted chucking reamers, and test with a plug gage.
21. Semi-finish ream the valve throat holes, leaving 1/64 in. for finish reaming in the cylinder assembly. Use 24-in. drill press, eight-spindle head.
22. Size ream valve guide holes with piloted reamers. 20-in. drill press, eight-spindle head.
23. Drill eight 11/32-in. holes in the bottom face and 14 letter G. holes in the top face on a Barnes two-way drill.
24. Mill eight bolt holes, three-spindle head on a drill press.
25. Drill two No. 4 holes for the valve cover, and seven No. 4 holes for the manifold and two letter G holes in the water inlet face, all on a Hammond radial drill with an indexing fixture.
26. Tap nine 1/4-20 holes for valve cover and manifold bolts, and two 5/16-18 holes in the water inlet with the same kind of equipment.
27. Tap fourteen 15/16-18 holes in the top face using a Hammond radial.
28. Drill five ¼-in. holes and one letter G hole in the top face on a 21-in. drill press, with a six-spindle head.
29. Hone the cylinder bores.
30. Water test.
31. Grind in the valves.
32. Inspect and send to assembly.

position over the point desired, and several different operations can be performed in rapid sequence.

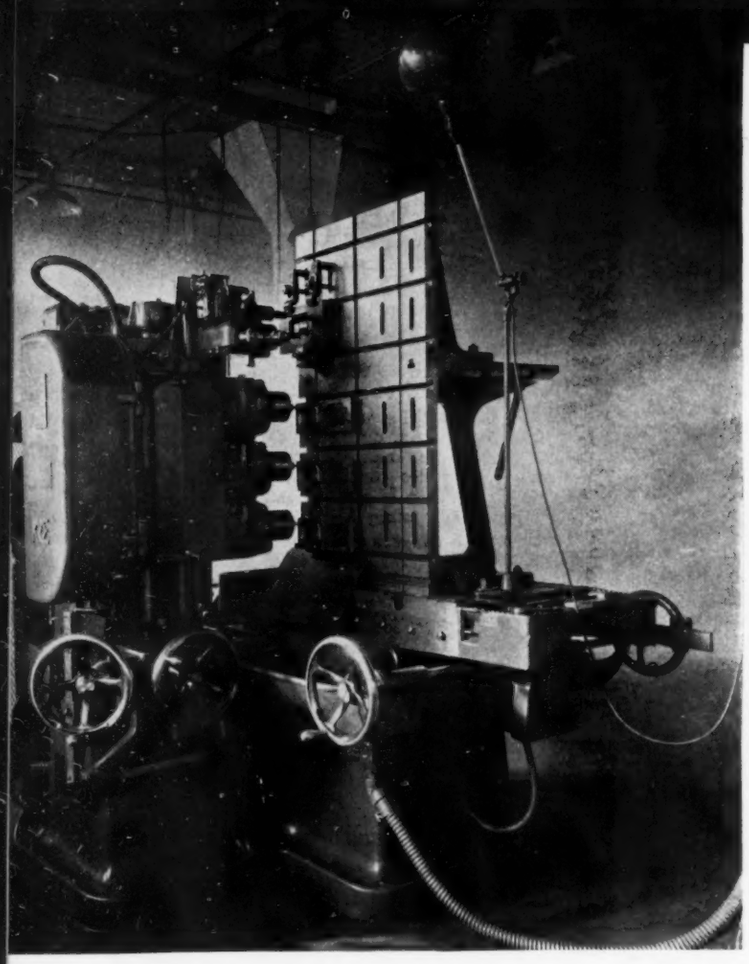
In the cylinder-block line one of the unusual operations is the grinding-in of the valves in their seats. This is done on a vertical eight-spindle machine with tongued drivers that engage slots in the valve heads. After the operation a valve carrier is attached to the block and the valves are lifted out and put into the carrier which has holes numbered from 1 to 8. The carrier goes right along with the block into assembly and the valves cannot be mixed up.

About 30 operations are required to produce connecting rods, and one of the most interesting operations is that of milling the big end on a Productomatic. This machine is set up with a 4-sided head and has eight cutters, five on the upper spindle and three on the lower spindle. The upper five cutters face the lower bolt seat, split the rod, face the opposite bolt seat and contour mill the oil dipper. The lower three cutters face the lower bolt seat, split the bearing, and face the other bolt seat as well as contour the opposite side of the oil dipper.

Left, after the valves are ground into their seats, they are lifted out and placed in a carrier that prevents loss or misplacement in assembly. *Right*, a simple indexing jig at the left holds the piston for drilling oil holes in the lower ring groove, using a portable drill on a stand. The jig at the right allows the piston to be oscillated for drilling oil holes in the piston bosses



Multiple Die Sinking

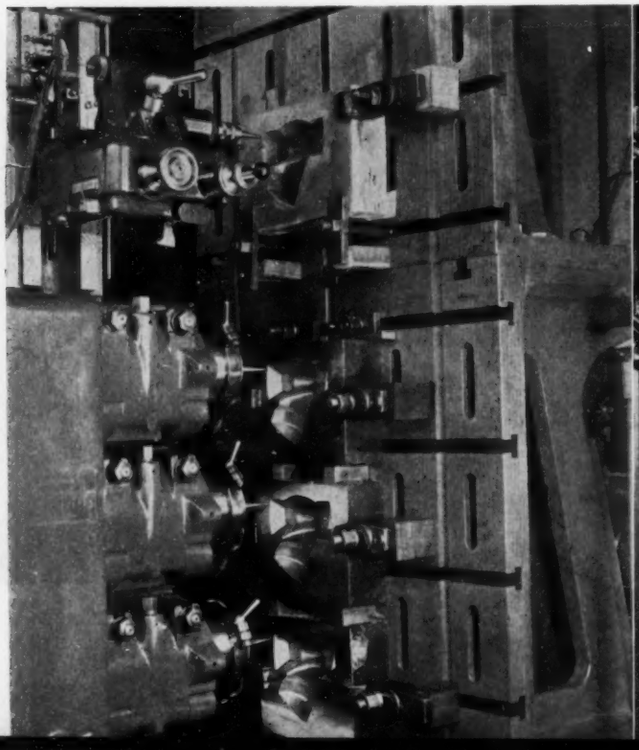


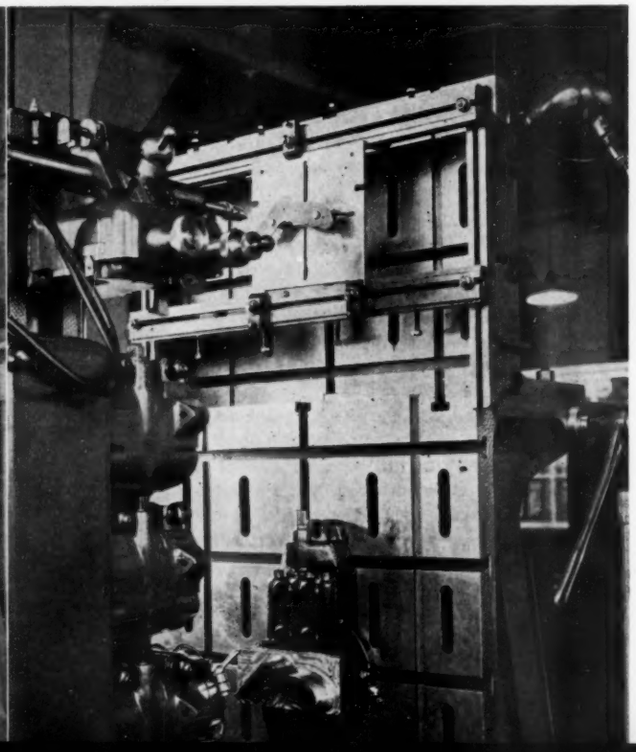
PRESSURE required on the tracer point of a standard Keller automatic toolroom die-sinker is not a function of the amount of power required to drive the machine. Therefore the development of the three-spindle Type BL-2416 machine (*AM*—Vol. 81, page 995) involved no changes in the fundamental operating principles of the Type BL, single-spindle machine on which it was based. When set up for three-spindle operation, the cutting time for three pieces is approximately equal to the time that would be required for one piece on a similar single-spindle machine. Set-up time is naturally greater for the three pieces than it is for one, but

Three core-box patterns are machined simultaneously on a Keller die-sinker. Floor-to-floor time for the three pieces is 8 hours, which is little more than the time required for one piece cut on a single spindle machine

Three heat-treated valve-body forging blocks are set up for simultaneous machining. A fine finishing feed was used and floor-to-floor time was 16 hours. Little hand-work was necessary to finish the impressions

A sheet-metal templet guides the tracer for machining this blanking punch. Set-up and cutting times totaled 3 hours, approximately the same time that would be required on a single-spindle machine. Note that set-up was made by mounting a vise on the faceplate

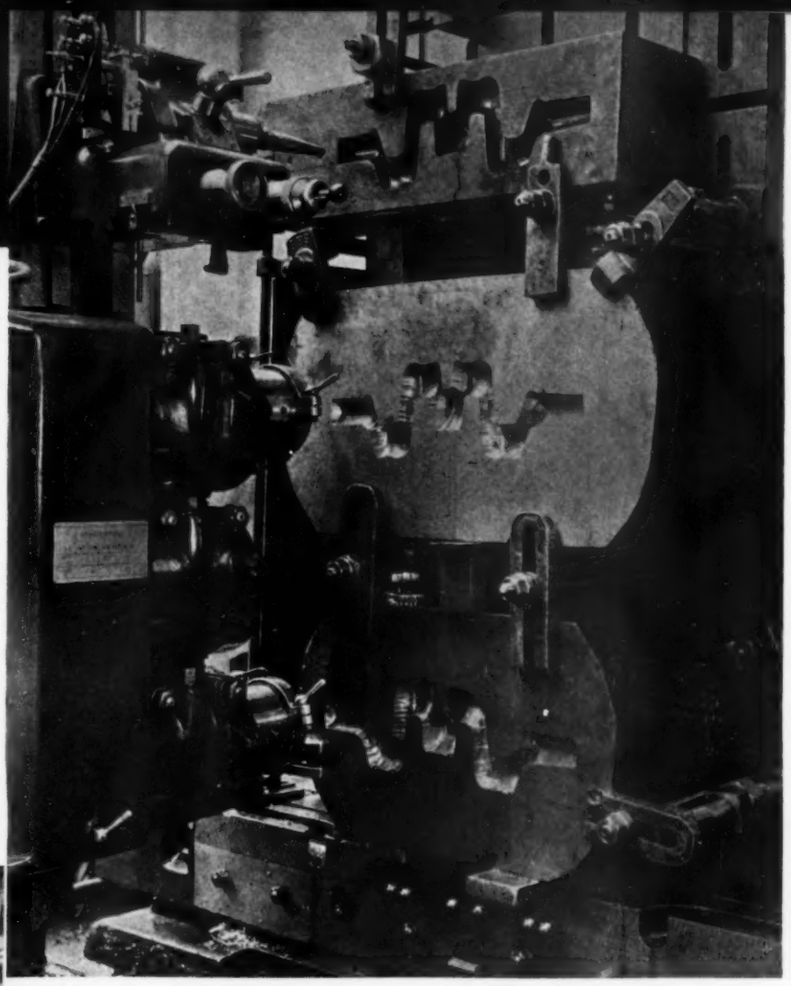




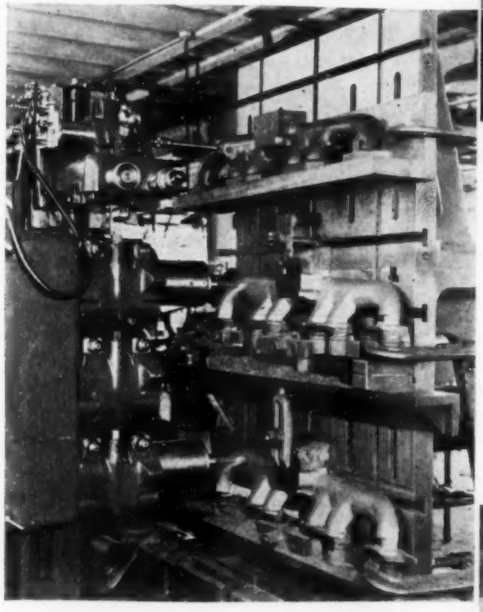
there is still a substantial saving in floor-to-floor time per unit.

Such savings, which have been found to run as high as 60 per cent, make it possible to put on the machine many jobs which otherwise would be finished by hand. Interchangeability can be assured at a reasonable cost on many metal pattern and core-box jobs, and it is possible to put a high degree of finish on "first" pieces which would otherwise be used in the rough state because of prohibitive costs.

These three-spindle machines can be set-up to use one, two or three spindles. When one spindle is used, set-up and cutting times are what they would be on a standard single-

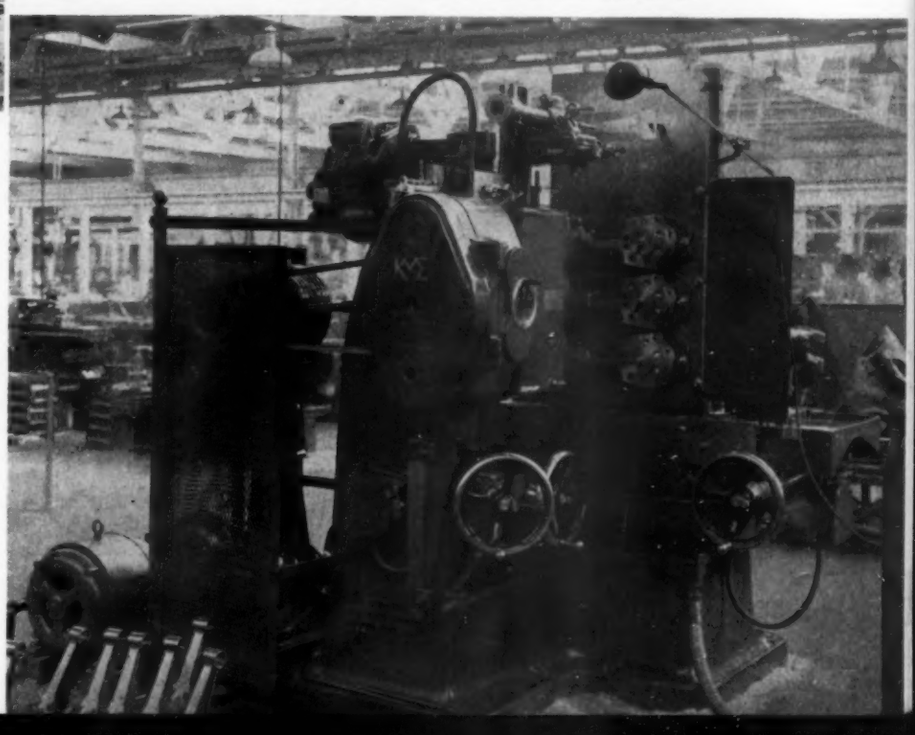


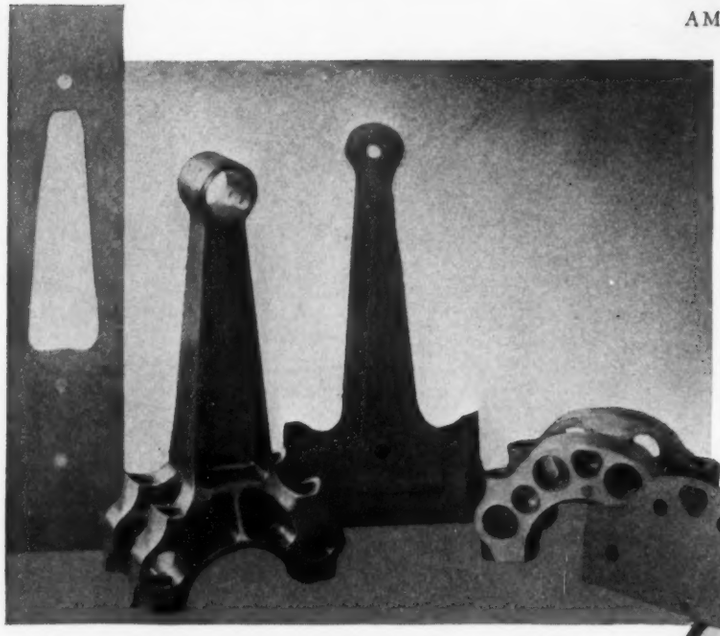
Only two forging dies for small four-cylinder crankshafts used in one of the British passenger cars can be handled simultaneously, because of the size of the blocks. Time for producing the two impressions, including set-up and grinding and changing cutters, was 36 hr. 40 min. with a fine finishing feed. This was less than an hour in excess of the time required for one block in a single-spindle machine



Metal manifold patterns, too large for cutting three at a time, can be cut in multiples of two as the vertical range of the machine is greater than the spacing between spindles

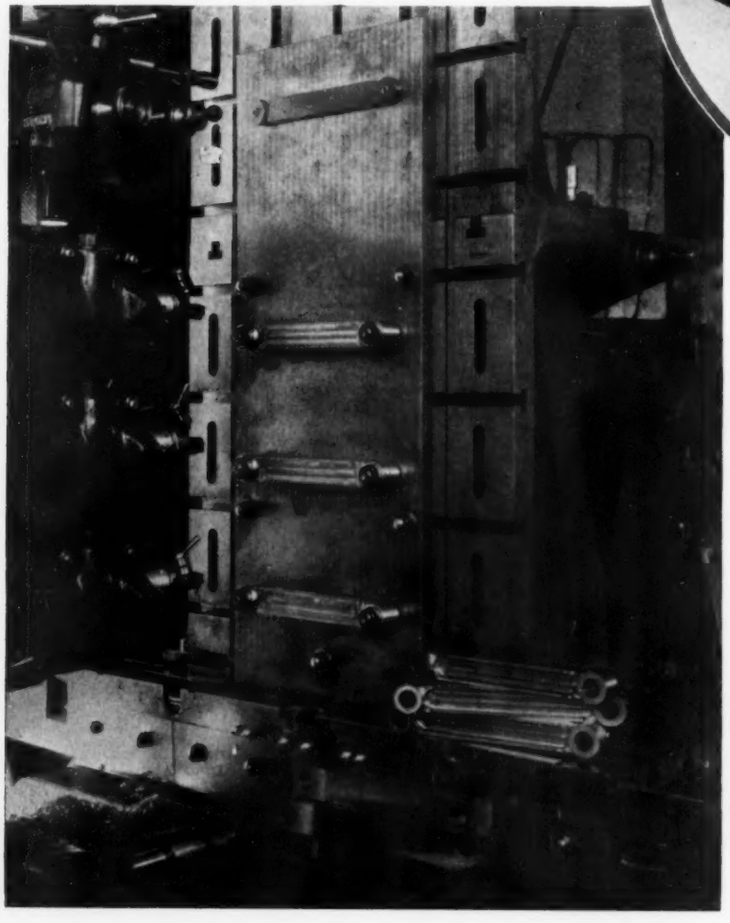
Light, sheet-metal templets guide the tracer for form milling master connecting rods in an aircraft engine plant. Three master rods are set up on the fixture for simultaneous machining. Finished rods are shown in the foreground

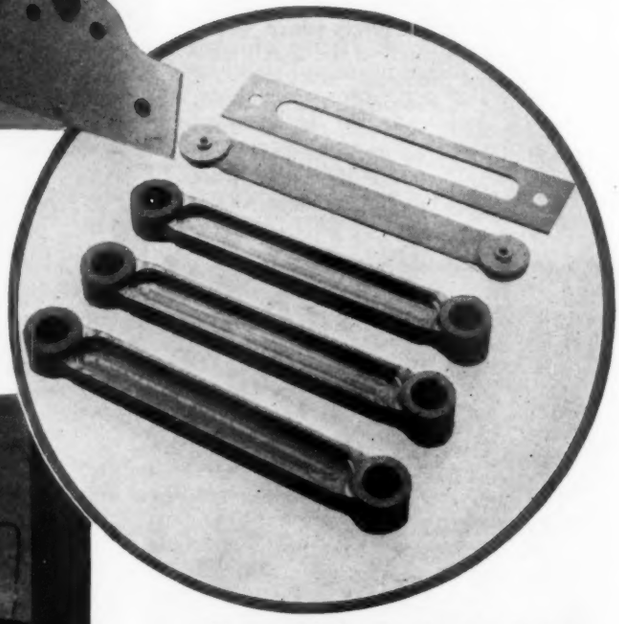




Master rod and cap are finished with templets used on a Keller three-spindle die-sinker three at a time. Templets are bored so that they can be successively located on studs in the fixture. This master rod is unusual in that the cap is a separate forging

Articulated rods can be produced as successfully as master rods. Three rods are shown mounted on the fixture with a templet in position for controlling the machine. Rods are slipped over studs, on the fixture plate, without disturbing the set-up





Three finished, articulated rods for radial-type aircraft engines are shown with the templets used to produce them. The entire outline and channel were cut from the rough forging and the circular bosses were milled with a radius cutter to leave the proper fillet

spindle machine. Where pieces are too large for cutting three at a time, two pieces can be set-up with material savings, because the vertical range of the machine is greater than the spacing between spindles.

While these machines are particularly applicable in the general field of die, mold and tool work, the growing field of profiling irregular shapes in experimental or semi-production quantities presents many uses. Included in this category are such parts as cam levers, special machine parts and a multitude of aircraft-engine components. Requirements of weight and accuracy demand that many of these parts be machined all over.

Application of the three-spindle die sinker to the manufacture of master connecting rods and mating articulated rods is shown in three of the accompanying illustrations. Forgings are first rough machined, and heat-treated, then mounted on studs on the Keller machine faceplate for finish machining. This operation consists of milling around the outside of the shank of the rod as well as the channel. Deep pockets and pin holes are accurately located and finished. Successive machining operations are performed without loss of set-up time, as the templets are accurately bored for interchangeable mounting on the fixture.

TALKING SHOP

Cheer for the "Over-Fortiers"

In spite of numerous denials it is the policy of some employment managers to set 40 as a deadline in hiring men and women. Just how much Dr. Osler's ukase on the subject long years ago is responsible, is hard to say. But we have two instances that should bring cheer to those who were born before 1897.

A certain large toolroom had a job that called for a hole 0.030 in. in diameter through a steel block 1¾ in. thick. And it had to be straight. All of the toolmakers who tackled it fell

down on the job. In desperation they sent for a man of 65 who had been sidetracked on account of age. He did the job. We hope they hired him back, if he wanted to come.

Another bit of cheer is that of a well known engineering organization which will not consider hiring a man *under* 40. Of a dozen men employed during the past two years the average age is 58. And this organization is growing in importance all the time. It finds that ability, plus years of experience, can handle tough ones.

Page Radio Amateurs

There's a new source of material for machine operators on extremely fine work! A well established concern decided to go into a new line that required a lot of small parts made to very close tolerances. Some of the operations were fussy and difficult and most of the regular machinists who tackled the job threw up their hands on work that just couldn't be done. Just how the boss got the idea is a mystery. But he scouted around for a crew of young men who had been radio enthusiasts, building their own sets. While many of them hadn't heard of "tenths" they had done all sorts of work that had to be just right.

They proved to be apt students or apprentices, and the result has been most gratifying. Not knowing of the things that couldn't be done, they followed instructions—and did them. Both finish and accuracy are essential. In fact the desired accuracy cannot be secured without a proper finish. There may be other operations in which amateur mechanics can be trained.

Dust and Temperature

Increased precision means greater attention to temperatures, among other things. Constant temperature rooms are becoming more and more common in shops as well as in the inspection department. In fact they should go together. And this does not necessarily mean "air-conditioned." We use this term much too loosely.

But there is another factor fully as important, especially where the work is of small size—freedom from dust particles in the air. Size changes due to temperature are minute with parts of small diameter. But a small particle of dust may raise hob with measurements or with fits. So some shops are washing or otherwise cleaning the air that comes in and maintaining a definite air pressure inside the shop. In this way dust particles that may be generated in the shop are blown out of the discharge vents. When working to "tenths" we have to take precautions that would have seemed foolish ten or more years ago.

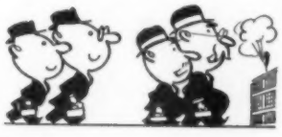
Unbelievable Distortion

Many who have little experience with metals consider them as rigid and unyielding. As an example of the fallacy of this notion, we recently ran across a case where unbelievable distortion took place with extremely light pressure. It was a small ball bearing for a rather delicate instrument. The bearing fitted into a small brass rotor with so light a pressure that it was put into place with the man's thumb. Even this pressure caused an appreciable difference in the freedom of rotation.

The construction has been changed to permit the bearing to drop into the recess by its own weight and hold it in place by a collar on the outside. This removes all radial pressure and has proved a satisfactory solution of the problem.

Father-and-Son

We have seen father-and-son banquets, father-and-son golf tournaments, father-and-son tennis, and now we have found a father-and-son factory. Every morning when the starting whistle blows for a certain testing machinery factory, father and son open the front office and fathers and sons start the machines in the shop. The precise work of producing instruments has been handed down

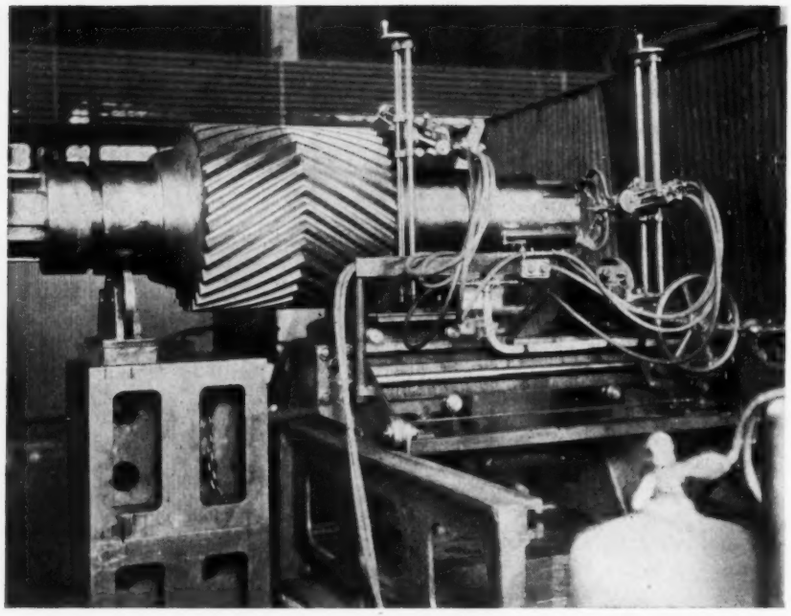


from father to son for three generations in the front office and from grizzled veterans to eager sons in the shop for as long a time. Even those that come in as engineers have to take their turn in the shop.

Which Customer?

As long as engineers differ as to the value of different metals and constructions, the machine business will continue to be interesting. We recently saw two well known gear hobbing machines going through on the same shop order. One machine had a cast iron index worm wheel while next to it the machine had a bronze wheel. Each customer insists that his specification makes the best machine. The builder gives each what he wants—but uses cast iron on machines for his own shop. If, as some contend, the customer is always right—which customer?

The Editors



Straight teeth can be hardened with one torch head in the same way that these splines are being hardened. Both torches can be kept in operation by ganging two wheels on one arbor

Torch Hardening for Gears

Recent developments have made machine flame hardening of wearing surfaces a production process

W. E. SYKES
Farrel-Birmingham Company

HARDENING GEAR teeth by means of an oxyacetylene flame followed by a quick quench was practiced twenty years ago, but made little headway until the introduction —some seven or eight years ago—of a machine adapted to guide mechanically a suitable torch fitted with a water jet. This gave more uniform results and was more economical than the manual method. A. E. Shorter pioneered this development in England, and the method has created much interest in the United States.

This process has the appearance of being remarkably simple, which is perhaps its greatest disadvantage. It has often been assumed that it is a simple matter to devise a mechanical method to guide a torch with a water jet attached. But the haphazard way in which the operation has been carried out has often caused disappointing results, and in consequence, torch hardening has been deprecated in certain quarters.

It is well known that when a carburizing process is used, or any other hardening process, including the nitriding process, suitable steels must be adopted. When the case-hardening of gears was first introduced considerable trouble was experienced because many makers did not realize how important it was to obtain what was called at the time a pure steel. In view of this knowledge and experience it is strange that many experienced engineers should expect the torch hardening process to operate successfully on almost any material. It is hardly necessary to explain that the application of a torch to poor steel will not eliminate its impurities and other defects. Poor material torch hardened, or hardened in any other way, may give worse results in service than if it were unhardened. It is easy to ruin an otherwise good gear with the torch hardening method; and it is also easy to make a poor gear into a hopelessly bad one.

The torch hardening method possesses so many advantages that it is likely to be used on an extensive scale notwithstanding a few failures and a certain amount of disparagement. It has the extremely important advantages of hardening gear teeth without appreciable distortion and of doing this relatively economically. The knowledge of its limitations is as important as the knowledge of its disadvantages.

Carbon Steel Satisfactory

Up to the present, non-alloyed steel containing from 0.40 to 0.60 per cent carbon seems to be suitable. Some of the alloy steels have given good results, but greater care is necessary to apply the correct heat and to apply the quenching fluid at the correct distance from the heating flame. Some steel castings containing

Presented before the American Gear Manufacturers Association, Lake Wawasee, Ind., September 21, 1937.

as low as 0.30 per cent carbon with a high manganese percentage will also harden satisfactorily.

One of the difficulties in using the process is to gage or measure the temperature of the heated metal. No really satisfactory pyrometer or other temperature measuring instrument is available which is applicable to the torch hardening method. And it seems equally difficult to ascertain the correct temperature or to measure the temperature at the place the quenching fluid strikes the work. There is also another difficulty: It seems impossible to correctly ascertain the hardness of a gear tooth except by removing it from the gear. None of the available hardness testing instruments seem adapted to operate on the gear tooth surface when it lies between two teeth. All development work, however, presents some difficulties and progress consists mainly in overcoming them.

Results Are Good

If we cannot measure the hardness or the temperature, but can get good results without doing so there is no reason to discard the process pending the development of suitable instruments. In nearly all developments the method and machine came first and the instruments of measurement and verification came later. The method has been satisfactorily proved to be useful, and the machines available have proved suitable.

The machine developed by the Farrel-Birmingham Company is especially developed to harden gears which connect parallel axes. No attempt has been made to apply it to the hardening of worm gears or bevel gears. The Gleason Works, however, has developed a machine for the hardening of bevel gears.

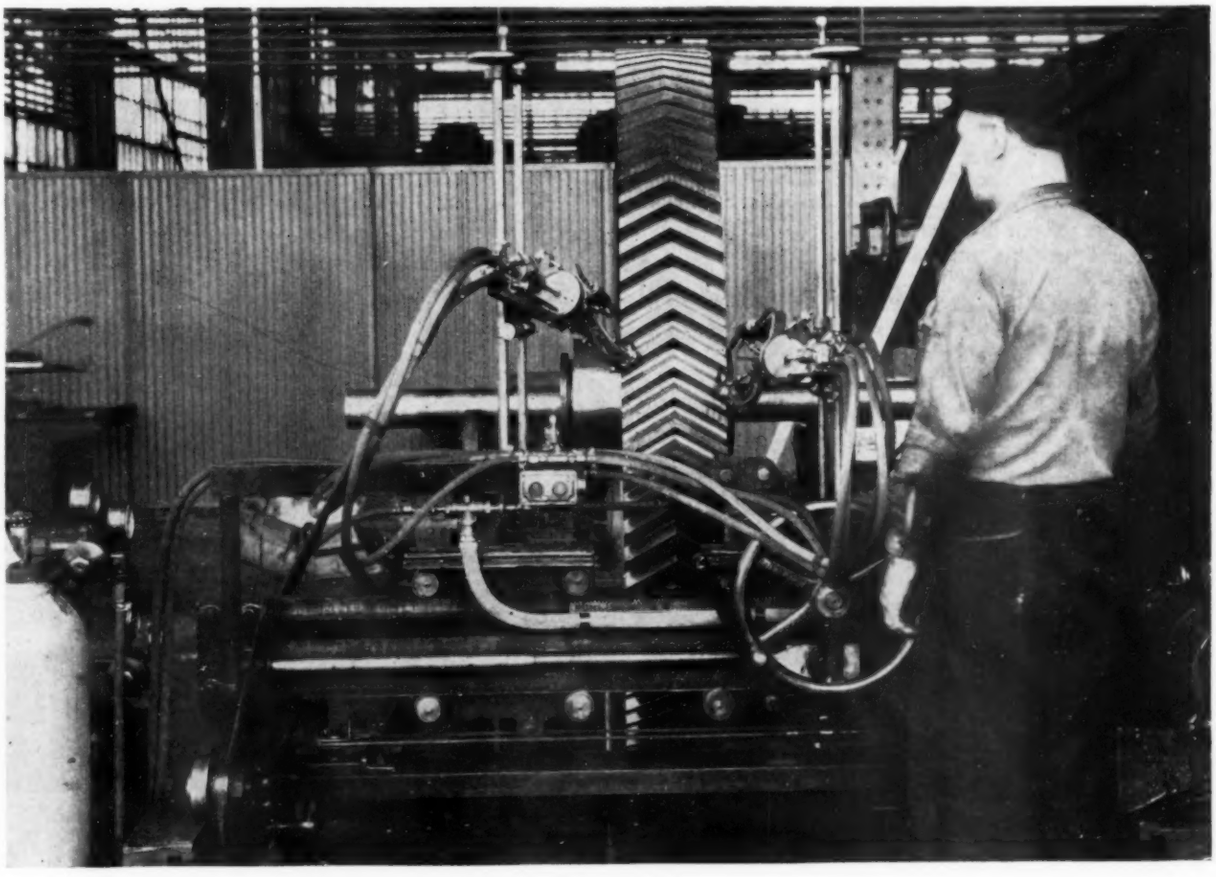
The torch heads are provided with mechanism for making suitable adjustments for correctly positioning the flame jets and the water jets, as may be seen in the photographs. These adjustments are important. It is necessary that the adjustment device be capable of imparting very fine and precise movement to each of the several jets. Each torch head equipment is carried on separate saddles which are adapted to traverse on a cross rail which is adjustably mounted on the main bed of the machine. The mechanism for traversing the saddles consists of a screw with a split nut operated in the same way as the lead screw and nut on a lathe. The screw is driven by a motor through a Transitorque variable speed gear and a worm gear; therefore a wide range of traverse speeds can be obtained.

Constant Water Supply

The water supply is carried in the tank which forms part of the base of the machine, and it is carried to the water nozzles behind the flame nozzles by a motor-driven pump. In addition the temperature of the water is controlled by keeping a constant supply running into the tank from the water mains while a constant amount is drained from the other end of the tank. The water temperature is, of course, easily measured by a thermometer and can be kept nearly constant. A constant water pressure is necessary. Direct connection of the water nozzles to city water mains proved troublesome due to variable water pressure.

When helical or herringbone gears are being hardened it is necessary to rotate the wheel in unison with the traverse of the torches. This is accomplished easily by means of a pin guide. It is a simple device for caus-

The right hand helix of one and the left hand helix of another tooth of this herringbone gear are hardened simultaneously as two torch heads with two jets each go into action



ing the torches to trace the correct helix and it obviates the necessity of the complicated and unsatisfactory mechanism used on earlier flame-hardening machines.

The various control valves for the gases and for the water jets are interesting. It is necessary, if uniform results are to be obtained, that each of the jets has the same heating capacity; and for quick and ready manipulation it is desirable that all the jets be controlled by one valve. The fine-adjustment valves which give the correct proportion of oxygen and acetylene are separate, however. They are placed between the main control valve and the torches. Therefore after they are properly adjusted, the main control valve can be used to shut off the flame, and also to turn it on and ignite it.

The tracer pin referred to above is also used as the index device. When the saddle is moved so that the pin is out of engagement with the work the operator moves the wheel by hand so that the next tooth space is opposite the pin. He then moves the hand-wheel shown until the pin engages the gear again. This is a quick operation and for repetitive work could be made automatic; but when a large variety of work has to be done an automatic mechanism is impractical.

Economical Tips Found

Considerable experimental work has been done to obtain the most efficient flame tips in order to conserve the gases. Many torches have been tried which have proved extremely wasteful. Those now in use are remarkably economical

Up to the present this machine has been found suitable for hardening from 4 D.P. to 1 D.P. It has been used for pitches as fine as 6 D.P. but, naturally, for the fine pitches it is not as satisfactory as for relatively coarse pitches. It is believed that it is practicable to harden as fine as 8 D.P.; but when the pitches are small the depth of hardness needs to be very precisely controlled. Moreover, the work is generally tedious and relatively slow; for it can be seen readily that to harden 100 teeth, 6 D.P., takes nearly as long as to harden 100 teeth, 1 D.P. In consequence there is less to show for the labor and expense involved when fine pitch teeth are being hardened. Fine pitch gears are usually of small diameter and can be more satisfactorily hardened by other methods.

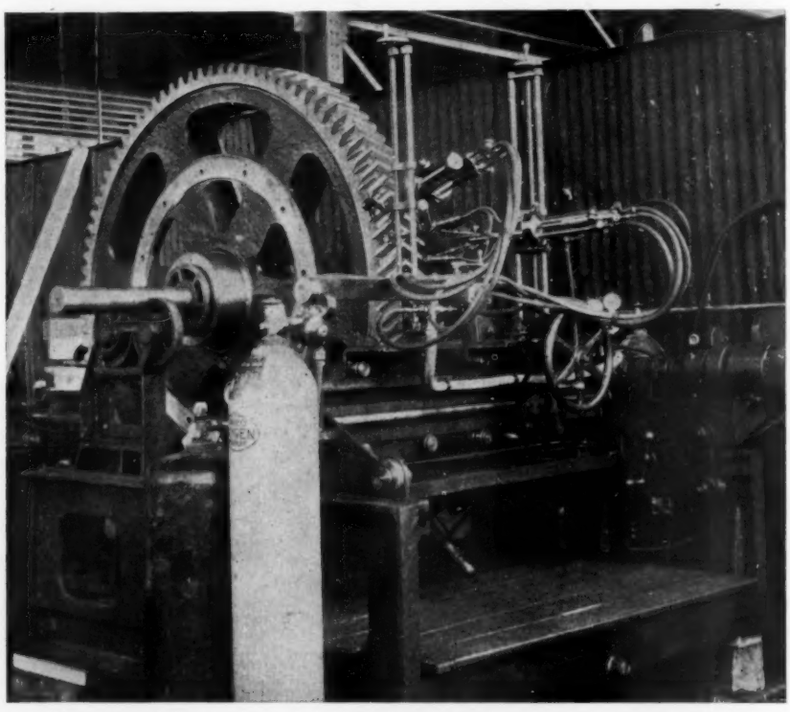
Much experimental work has been necessary to obtain satisfactory results, more especially for the reason that there is no reliable means available for gaging or measuring the temperature, the hardness and the depth of heat penetration, or hardening effect. It has been necessary to ascertain the correct gas pressures and flames for different pitches and different materials; and this in turn has necessitated the determination of the most suitable size tips or jets to use. Much of this data has already been obtained and tabulated with the result that an operator can work to a chart and obtain uniform and satisfactory results without knowing the exact temperatures which are used.

To obtain data test teeth have been provided which we may call "false teeth." They are made in the form of narrow strips having the contour of a gear tooth, and are attached to the periphery of a cylinder. After they are hardened at different speeds and various trial settings of the equipment, they are taken off the cylinder, checked for hardness by means of standard hardness testing instruments, and are broken in order to ascertain the depth of the hardness. They are also polished on the surface of the fracture, and the hardness is measured at the surface of the gear tooth and at various depths therefrom. In addition these pieces serve to show whether or not there is any appreciable deformations. To obtain this essential data is laborious and costly, but it can be regarded as forming part of the equipment and therefore is classed as capital expenditure.

One question often asked is, what is the hardness obtained? We have found that we can obtain any hardness between 60 and 80 Scleroscope or 400 to 550 Brinell. However, it is as important to know what the desirable hardness for a torch hardened gear is. According to experience up to date it does not seem desirable ir beneficial to obtain a hardness greater than 75 Scleroscope; indeed, it may be that a hardness around 70 Scleroscope is better. It is not known for certain whether a very hard surface on any gear tooth is desirable. It is possible that a spring temper is better.

Hardness Is Graduated

The depth of the hardness is, of course, important; but it is more important that the hardness fade away gradually from the surface of the tooth towards the core or center of the tooth. A very sharp line of demarcation between the hardened portion and the soft portion is disadvantageous, and such a result has to be guarded against. It is easy to get this undesirable result by making the metal too hot and too quickly quenching it. A vast variety of experiments has been made: for example, torches have been used in which the heating flame was completely surrounded by water. This results in a great waste of gas and generally a surface which



The gear wheel is mounted on an arbor or in some cases on its own shaft, supported by pintle bearings. Variable-speed drive for traversing mechanism is visible at the end of the machine

is too hard and which shows a line of demarcation which is too sharp. It has the interesting result of leaving a bright surface even if the gear before hardening is rusty.

Many questions have arisen as to the desirability of preheating and of drawing. The author has not found that either of these operations are necessary or desirable. Preheating, if desired, can easily be done without any appreciable extra expense, and a drawing operation can be carried out on the machine without great trouble; but it is believed that this last operation, at least, would be detrimental.

Conditions May Vary

It is advisable to explain that almost similar results can be obtained with a variety of operating conditions; for example, approximately the same result can be obtained with a 4-in. speed of traverse of a torch as with a 6-in. speed providing the jets, or tips, are suitably altered as well as the position of the water sprays. And it is also advisable to explain that although a good set of operating instructions have been compiled they are probably not final. It is natural to expect that improvements will be made as experience is gained.

Some remarks regarding the results obtained with torch hardened gears in operation may properly be made. Up to the present there are approximately 700 pairs of gears which have been hardened on the machine described. These have given excellent results with the exception of one pair which showed some spalling near the ends of the teeth. However, it was found that the gears were not mounted in true alignment, and it was not possible to determine whether the undesirable effect was caused by the torch hardening or to the mounting of the gears. There are many sets in operation which have replaced similar gears unhardened, and the torch hardened ones have shown greatly increased life up to the present and are still running satisfactorily without discernible wear.

Many customers have formed a habit of specifying torch hardened gears, and have occasionally specified them when they were either unnecessary or undesirable—the last mainly for the reason that sufficient knowledge as to the performance of similar gears was not available and the application without such knowledge would be too risky for a service of vital importance.

As one would expect, those who are most enthusiastic initially are those who most earnestly deprecate the process when there is any sign of trouble or when magical results in increased load carrying capacity are not obtained. It has been stated that torch hardened gears will carry twice the load of unhardened ones. It is probably true that a properly torch hardened gear made of the correct material will carry at least twice the load of a gear made in the same material unhardened; but it is by no means true that any gear torch hardened will carry the same load as a gear of the same size made in a better material unhardened.

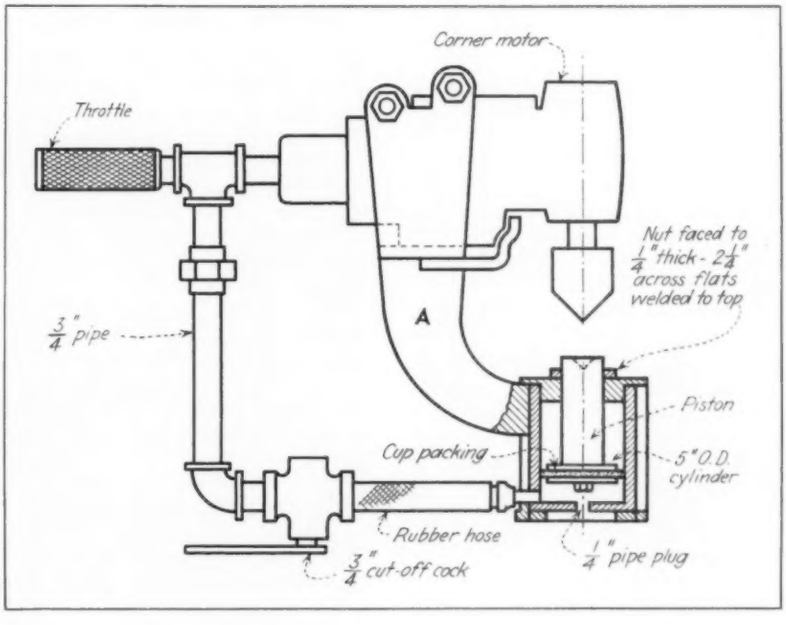
Another mistake which many have made is to assume that because a gear is torch hardened it will stand great abuse and that it is not necessary to mount it properly or lubricate it properly. A torch hardened gear with only a 30 per cent bearing surface on the teeth cannot reasonably be expected to be better than an unhardened gear with 100 per cent bearing surface. It may be worse even than an unhardened gear; for if an unhardened gear is mounted out of alignment it will more quickly wear to a reasonably large surface contact than a hardened one. Gears hardened by any process should be mounted properly and made correctly. Torch hardening, or any other kind of hardening, will not eliminate faults in machining and mounting; and no hardening process so far discovered will make bad steel into good steel.

It can readily be seen that torch hardening is not limited to the hardening of gear teeth. It is already being used for hardening many other machine parts with success. It seems probable that in the future every well equipped hardening shop will have facilities for torch hardening. It is already being applied abroad successfully to automobile engine crankshafts, and other machine parts.

Air Drills, Feeds and Holds

Using the same air supply to drive the drill and to hold the work makes possible a convenient flue sheet countersinking machine. A frame *A* is cut out of ½-in. plate, being made up of a right and left side welded together. The upper end carries what is known as a "corner" air motor which drives the spindle carrying the drill spindle at right angles. The lower end incloses and supports an air cylinder which acts as a "hold-on" to support the plate being drilled.

Air is piped to both the motor, through the throttle and handle, and to the supporting air cylinder. Placing the gap of the tool over the edge of the boiler plate and positioning the countersink in the hole, the throttle is opened. Air flows to the motor, driving the spindle, and also enters the cylinder, holding the plate against the tool and also acting as the feed. The amount of air in the hold-on cylinder can be regulated by the ¾-in. cut-off cock in the air line.



ROUND TABLE

Where There's Smoke

"Hello, Al, have a nice trip?" Ed stepped forward to greet his friend as Al left the train. "Did you run into anything new this time?"

"Glad to see you, Ed. Yes, I picked up several ideas that may have possibilities. One is a plan to put in a smoking room for the shop men. It wouldn't cost much and might eliminate a lot of visits to the casting yard."

"Now I know you're balmy. Haven't you enough trouble without inviting more?"

"Let's look at it from a practical standpoint, Ed. The problem of shop men smoking during working hours has been a thorn in the side of plant superintendents and foremen for a long time. You and I both know that men smoke regardless of posted warnings and shop rules. They sneak smokes in out-of-the-way places whenever they think they can duck the boss. They always will and ignoring the problem doesn't solve it."

"Permitting smoking during working hours would mean that the man would waste a lot of time away from their machines. The solution to the smoking problem, Al, is more drastic penalties, not a surrender to those few who take advantage of the boss. Why, you'd never get any work done."

"Don't you believe it, Ed. I talked with Ralph Johnson about it the other night. He's superintendent of a shop specializing in small, special-purpose tools. They have a fireproof plant equipped with sprinklers and they permit smoking anywhere in the plant as long as it doesn't interfere with the work. He says that the men haven't abused their privilege and the management is perfectly satisfied."

"But the state fire laws wouldn't permit that in your building, Al."

"That's what I told Ralph, but he suggested a scheme several small plants in his district have tried with good results. They put in small, glass inclosed rooms with fireproof

floors. These rooms have benches and a metal box filled with sand or ashes, into which are tossed all the burned matches and cigarette stubs."

"All they need with that scheme, Al, is some magazines and a second crew to do the work. I'm against it. Why some men would spend half the day in there."

"Not when they can be seen through the clear glass partitions, Ed. They're in full view of their foremen and fellow workers all of the time. It's eliminated smoking in the washrooms and warehouse, too."

Would smoking rooms improve employee relations, or would the privilege be abused? Can production be kept at a high level with such a scheme?

DISCUSSION

An M.D. on the Payroll?

Most employees will view a voluntary physical examination by the company physician as something of benefit to them. Many persons have unsuspected physical troubles and an examination will often result in a healthier working force as well as a protection to the employer against the hiring of those who may be physically undesirable.

The rejection of one undesirable seeking employment could conceivably save a years' retainer for the doctor. First aid classes accomplish worthwhile results in alleviating suffering and often result in the saving of life. —L. C. MASON

No two men are alike and there is usually something wrong with everyone of us. Often a man puts in a day at the shop when he is really sick; the next day he feels up to par again, but if the doctor knew of it the man would lose a day or more. Just about the time all of the men would be needed badly half of the force would be put to bed.

In my opinion, medical advisory service should be kept out of business. It is industry's responsibility to safeguard machinery and remove fumes and gases, but beyond that a doctor would cause ill feeling, suspicion and dissension.

Once a doctor became firmly established in a plant, his first thought would be to make his duties as light as possible. To accomplish this end, he would probably try to dictate to the men as to how they should conduct themselves while away from the shop. —W. E. FISCHER

Whether or not advisory medical service in a machine shop can be justified depends entirely on the shop. A shop employing a hundred men,

for instance, would be too small to warrant the services of a doctor. Larger concerns, employing hundreds of men, find it to their advantage to have their own medical department.

If Al's shop is large enough, I believe that it will be a good plan for him to have a doctor visit the plant. Free medical inspection will assure a healthier group of workmen. Sickness is this country's worst enemy and if Al can reduce the number of hours a man is detained from his work on account of illness, his idea will be profitable. —ROGER C. DICKEY

International Paper Box Machine Company

An individual should be measured by his actual value to the shop, whether he be a "rolling stone" or a steady worker. Taking all factors into consideration, I believe that, in general, the steady worker possesses a slight advantage over the floater.

The "rolling stone" who changes his job in an effort to better himself possesses certain advantages over the steady worker, particularly in tool and die work in a small plant where the design of tools originates in the shop. Due to his wider experience, this type of workman is usually able to offer more ideas in respect to the construction of new tools.

On work of a semi-skilled or production nature, the steady worker is usually more valuable. He becomes a specialist at his work and, if he possesses normal intelligence, he will continually improve his efficiency through the development of kinks associated with his job. All too often, the floater will quit his job just when you need him the most, leaving you to hunt for new help at a critical time.

—PETER L. BUDWITZ

While it would be a fine thing for the employer to keep his best men with him continuously, the fact cannot be overlooked that such men usually have worked in several plants before securing the desirable information that makes them so valuable. Such a man has discovered at first hand which methods are best, as well as what methods should be avoided because of their inefficiency.

A competent, resourceful man who studies his job thoroughly usually has a deserved reputation for quantity and quality of work. He effects a saving on the wear and tear of equipment and sets a wholesome example to his shop mates, who are bound to be influenced to some extent by his actions.

It is always true that the inefficient class of help requires the most supervision. If the actual value of the best and the poorest grades of help are credited for their exact value to their employer, the most efficient men are nearly always underpaid in comparison with those less efficient. —JOHN MARK MAY.

Al is quite right in defending Bill Harris as an experienced operator. Unquestionably Al profits from the ideas that Bill has been able to pick up on his rounds.

Yes, the floater will bring some good ideas, but is he a good citizen? He is not in any place long enough to form lasting friendships and it is not likely that he will have much community pride. What does he care about local politics and about the quality of the schools? Did Al ever see a steady man and home owner who was at the same time an agitator and a radical?

—JOSEPH MANUELE

Equipment, Inspection & Test Dept., Westinghouse Electric & Mfg. Co.

New Man

A good start will go a long way toward making the new employee a good man for the company, while an improper start requires a long time to overcome. Each one of us, at one time or another, has experienced the sometimes embarrassing circumstances of being a new man in a shop.

After I have talked with a prospective employee and satisfied myself that he is of the type wanted, he is taken into the shop and introduced to the foreman for whom he may work. This foreman shows him the work and explains the nature of the operations that he will perform. All of this is done before the man is actually hired and we find that taking him into the shop helps to indicate whether he will be a satisfactory workman and whether he is going to be contented after he gets started on the job.

When the new man is signed up for the job, he reports to the foreman with whom he has previously talked. From that point on, the foreman handles all of the details. He shows him around the department, tells him where to put his hat and coat, gets his tool checks, shows him where the tool crib is located and introduces him to the men with whom he will have immediate contacts.

While it isn't necessary or practical to introduce him to everybody in the shop, for obvious reasons, we try to make him feel at ease by being reasonably hospitable. We ask him to be careful and not to be afraid to ask questions, explaining that we do not expect anything sensational for at least a week or so. The new man is given an outline of our suggestion plan and our attitude toward proposed improvements is carefully explained. —O. W. WINTER

Showing a new man around the shop enables the foreman to form a better idea of his capabilities than if he merely gives him a job to do. The foreman, himself, can gain a lot of information by learning how things are done in other shops.

The position of a new man is always difficult, but if the foreman shows him about the shop before starting him to work it will help him to get started to the best advantage. —W. E. WARNER

Sompting, England

Believe in Signs

No matter how one looks at measures taken to ensure avoidance of accidents, such precautions are undoubtedly worthwhile from the economic point of view, as they help to minimize serious accidents and reduce the number of less serious ones. Where risks are unavoidable, it is in the interest of both employer and employee that all employees, especially those who have had little workshop experience, should be made conscious of these particular hazards.

The indiscriminate posting of warning notices are likely to do more harm than good, since they point out the danger without stressing the importance of taking proper steps to avoid it. Where all reasonable steps have been taken to make a work place safe, and there is still an unavoidable risk, then the poster seems to be the only additional precaution that can be taken.

The many serious accidents which occur because of neglect show the need for warning notices. The designer is being called upon more than in the past to provide effective safety devices on all types of machines, but there will always be cases where his best efforts will be ineffective and the poster must be used.

—W. L. WATERHOUSE

Hadfield, Bristol, England

Work-Holding Methods for Milling

Several miscellaneous clamping devices aid the tool designer when confronted with milling-fixture design problems

C. W. HINMAN
Tool Engineer
Kobzy Tool & Electric Manufacturing Company

SOMETIMES it is necessary to apply screw pressure in the bottom of a deep recess in the work, or across an interfering flange or rib. A typical case is seen in Fig. 159. It would obviously be difficult to enter or remove the work from the tool if *A* was an ordinary screw, or if there were wall or fastener interferences on the side opposite. The tool would have to be designed abnormally wide to clear the screw for removing the piece, or the screw backed out its entire length to clear the work. Either contingency is undesirable.

This difficulty is overcome by using the long pin *A* which slides through bushing *B*. Pressure on the pin is exerted by tightening the nut on the sliding clamp *C*. The pin is withdrawn by loosening the nut, then sliding away the clamp, and withdrawing it by cross pin *D*.

The possibilities and advantages gained by dividing a compound clamp into two parts are illustrated in Fig. 160. This construction carries a double compound equalizer and is not the usual self-contained type, but is divided into two distinct units, by which several varying thicknesses of work can be rigidly clamped for milling.

The yoke *A* swings on pivot pin *B*, it also carries the primary equalizer *C*, which in turn is mounted on tightening screw *D*. In its normal clamping position, the yoke rests on lug *E*. When the yoke is thrown back to remove and reload the work, it then rests on the back stops *F*, while leaf *G* automatically falls forward and rests against lug *E*. Leaf *G* carries two secondary equalizers *H*, which contact and clamp the work. The primary clamping presure is below the secondary pressure on the work, a condition favorable to holding the yoke down after clamping.

Three Pieces of Work

The leaf *G* is hinged in the horizontally swinging stud *J*. This feature provides the necessary clamping action for the secondary equalizers when their four bearing points are in contact with the three pieces of work. The work pieces are prevented from falling before closing the yoke by light spring plungers, not shown. The advantages in this design are: Increased strength because the number of pivot pins is reduced, greater clamping power because the equalizer leaf can be brought near the work, a large space for loading and unloading the work and for removing chips, and a compact and rigid design throughout.

Milling operations usually precede drilling operations because a finished casting provides the necessary precise surfaces from which to register in the drilling jig. On the other hand, a sheet-metal blank may have had several holes punched, the blank formed, and holes which are less in diameter than the material thickness drilled and reamed, and possibly other holes burred and tapped before milling. Such pieces are usually gaged for milling from one or more of the perforated holes, especially if the subsequently milled surfaces must be in accurate relationship to the holes. Conversely, the gaging points in drilling jigs for castings, are usually determined by the same necessity, that is, by the accurate relationship of the drilled holes to the points of registration.

Exceptions to these rules are rare. Exceptions might occur if the second-operation tool is completed first, and the job is run in reverse order to economize time in a "hurry up" consignment, but this is not a mechanical necessity. Another common exception is when the relation between the holes and milled surfaces is not important.

It is common practice in preparing rough heavy castings for milling to press one registering surface, usually the base, against the face of a disk-grinder. Sometimes, this operation is performed on light castings, against the abrasive-band on a belt grinder. This is quick and economical practice if the surface is suitable for the apparatus in which the part finally becomes a member. If the surface is the mounting base, belt grinding is generally found satisfactory, because all the milled surfaces register from it, and are therefore in geometrical relation with it.

If the first cut on a casting is

milled in a fixture, the piece is supported and clamped on three-point positive bearings, and two of the bearings are close to the cut. When the work is large, addition of "pop pins" or "screw jacks" may be necessary to support and steady the piece and thus avoid excessive vibration or chatter. In milling it is common practice that the main fasteners and supports be within $\frac{1}{32}$ in. from the cuts, if possible.

Fig. 161 represents a common type of the "swing bar" or gate fastening for holding pieces in drilling jigs and milling fixtures. This principle, while simple, is very convenient and effective. It is sometimes employed for locating or holding work for press tool assembling, and in special machine operations. Its outstanding feature is to provide the means for swinging a screw, or other locking devices, attached in the gate, across an interfering rib, flange, or work projection. Also, in opening or closing the gate, it permits an unobstructed entrance or removal of the work. A variation in design consists in exchanging the position of stop *A* and screw *B*, to suit special conditions. When necessary, the swing bar is designed as a sliding member, and then spans the opening across the flange by sliding, instead of a swinging movement.

Grubbing Fixtures

Cuts which are ordinarily thought impossible can be practically made on a milling machine, given the proper cutters and fixtures. For example, square cornered rectangular holes can be cut without leaving a radial sweep anywhere. In Fig. 162 the rectangularly punched hole is to be milled with square corners through a sheet-metal piece $\frac{1}{8}$ in. thick. Such operations are performed in a grubbing fixture in connection with a grubbing cutter. The cutter is 1 in. in diameter and $\frac{1}{4}$ in. thick. It has 32 teeth, each of 60 deg. included angle, as shown. There is side relief on both sides. The cutter is clamped in an oscillating arbor by only three of its upper teeth, at point *A*. The arbor oscillates in a bearing bracket secured on the overarm of the milling machine, and is oscillated by a crankpin through a hole in a sliding block confined in a driving arm attached on the small end of the arbor. The crankpin is driven by the milling machine main spindle. The cutter clamp being considerably above the diameter of the cutter, permits the full diameter to pass entirely through the work. The piece is positioned on a plate and held by clamps *B*. The work is fed up to the cutter

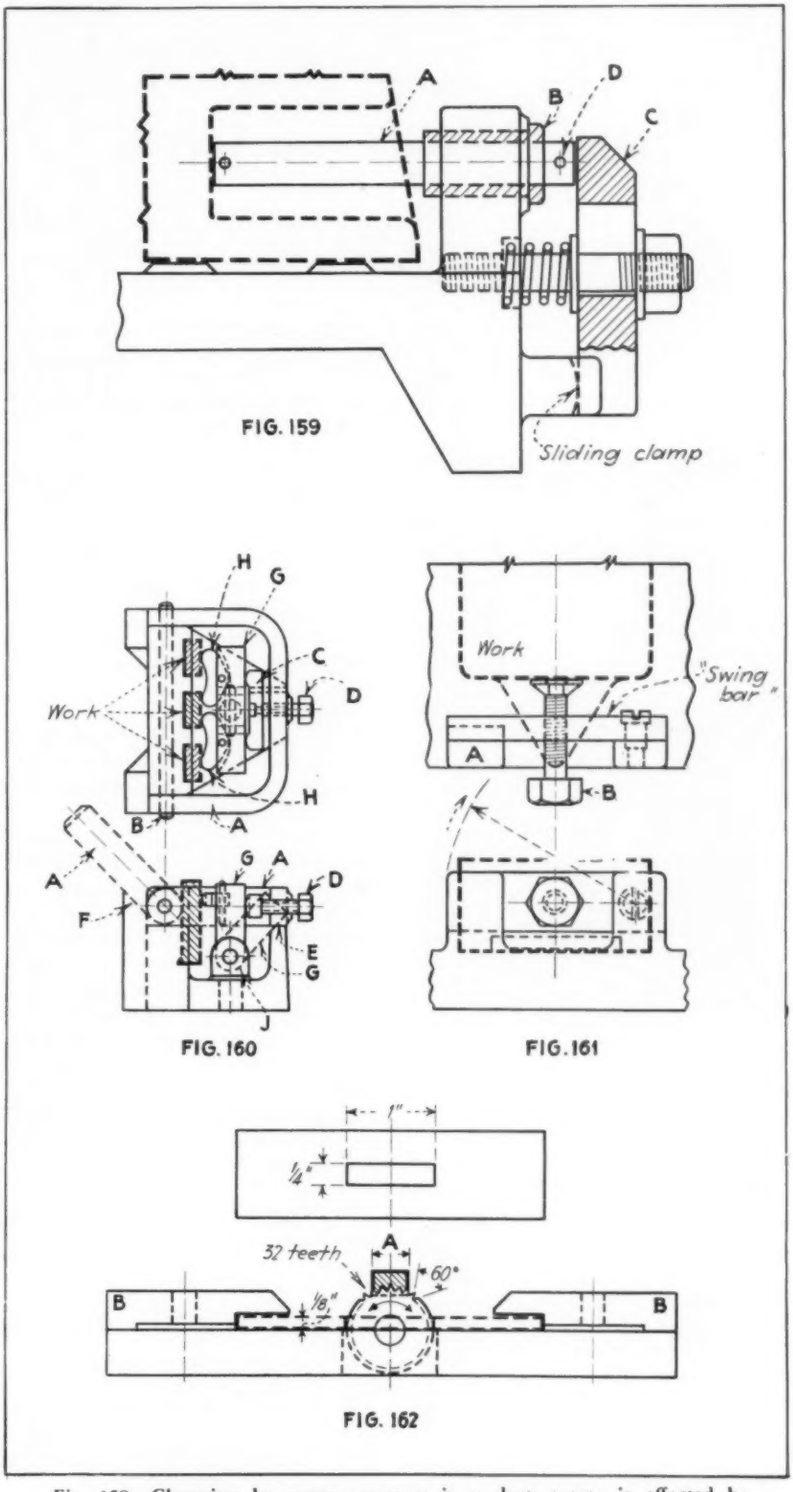


Fig. 159—Clamping by screw pressure in a deep recess is effected by having clamp *C* bear on the long sliding pin *A*

Fig. 160—With the divided compound equalizer the number of pivot pins is reduced, and several varying thicknesses of work can be clamped

Fig. 161—A "swing bar" or gate fastening will swing a screw or other holding device across an interfering rib or work projection

Fig. 162—Square-cornered, rectangular holes can be milled without leaving a radial sweep by means of a grubbing fixture and cutter

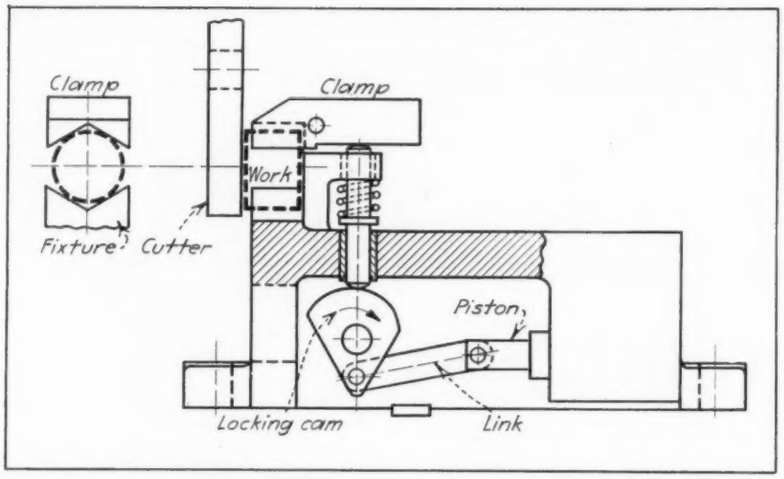


Fig. 163—A self-locking mechanism on air-operated fixtures will prevent the work from being released upon air-pressure failure

by elevating the table knee of the machine. A detailed account and drawings for grubbing operations were published (*AM*—Vol. 78, page 225).

Pneumatically operated clamping mechanisms are quicker in action, more constant in clamping power, and of greater convenience in use than ordinary mechanical clamps cumbered with screws and wrenches. In the design and use of air fixtures, however, several problems must first be solved before success is possible.

The initial air-line pressure per square inch must be a pre-determined standard. The pressure should be unvariable, dependable, not intermittant. The clamping power, in pounds, for each fastener must be approximately known, and the clamping pressure should be an increased factor of safety above the normal power required.

Calculate Clamping Pressure

The gain or loss in clamping power through linkage, leverage, cams, racks and pinions, or whatever mechanical means intervene between the piston connection and the clamping point, should be carefully computed. This data actually determines the necessary piston head area in square inches, which multiplied by the air-line presure per square inch equals the required clamping pressure. Having the piston head area, the internal diameter of the cylinder is readily found.

When P = air-line pressure in pounds per square inch, and C = pounds pressure required at the clamping point, and A = area of piston head in square inches. Then $PA = C$, and $A = C/P$. If D = internal diameter of the cylinder, and if $(0.7854)D^2 = A$, then $D = \sqrt{A/0.7854}$.

The cylinder length should be twice the actual stroke required plus the thickness of the piston head. This allowance is made to compensate for future alterations in the work thickness at clamping points, and for unforseen changes necessary in the leverage connections.

Another difficulty is air pressure failure at a critical moment during the milling operation, causing the work suddenly to be released with serious damage to the fixture and cutters. This can be avoided by designing a self-locking mechanism that continues to grip the work even though the air pressure fails. One suitable design is a clamp that is locked and released by a cam, Fig. 163, operated through the movement of an attached link between the cam and piston.

Part XX, the concluding installment of Mr. Hinman's series on tool design, will appear in an early number.

Practice Pin Measurements

IRA S. WILLIAMS

Pin measurement of gears, as explained by John Apelskog (*AM*—Vol. 81, page 843) proves a satisfactory method in most cases. However, all conditions must be favorble when depending upon pins alone as a method of checking. It must be definitely ascertained that the pressure angle of the involved gear is 14½ or 20 deg., as the case may be, otherwise pin measurement avails us nothing, and cutting the gears to suit tabulated pin measurements for a given pitch may lead us into difficulties.

Pin measurement will not tell us whether the teeth of a gear have been cut concentric with the hole, a common fault in hobbing. For this reason, I believe pin measurement should be supplemented by a further check secured by rolling the gears together after the correct center distance has been established. In the absence of facilities for rolling gears, the gear should be checked for eccentricity and depth of tooth by revolving it on a suitable shaft and applying the contact point of a dial indicator at the root of several teeth at various points around the periphery.

In checking helical gears with pins, conditions become a little involved. It is impossible for a straight pin to register properly on a helix, and the interference encountered, especially in gears of wide face or large pitch, precludes the possibility of the pin registering on the desired place on the tooth flank.

It must be remembered that, while the lead remains constant at all diameters, the helix angle of gears may vary greatly from root to outside diameter. Extreme caution should be exercised when checking helical gears with pins alone.

Diesel Buses in Denmark

Diesel-engine driven buses have been successful after prolonged experiments according to reports reaching this country from Denmark, where plans are underway for further development of this form of motive power for automobiles, tractors, motorboats and small stationary engines. A/S Burnmeister & Wain, Copenhagen, which has been testing small diesel motors for two years, has six small motors, each with six cylinders, developing 55 hp., under experiment. One of these has been mounted in a bus, which has been driven about 60,000 km. Another bus has completed 25,000 km. A third motor has been mounted in a small boat. The plant has twenty of these small motors building, and calculates that production of about 1,000 annually in three different sizes, ranging from 50 to 110 hp., would make it possible to meet the sales price of foreign diesel motors.

Another Danish company, the Bur-Wain Autodiesel A/S., has been formed in Copenhagen to manufacture small diesel motors for automobiles. Production will begin as soon as the subscriptions for preferred stock reach a satisfactory figure.

IDEAS FROM PRACTICAL MEN

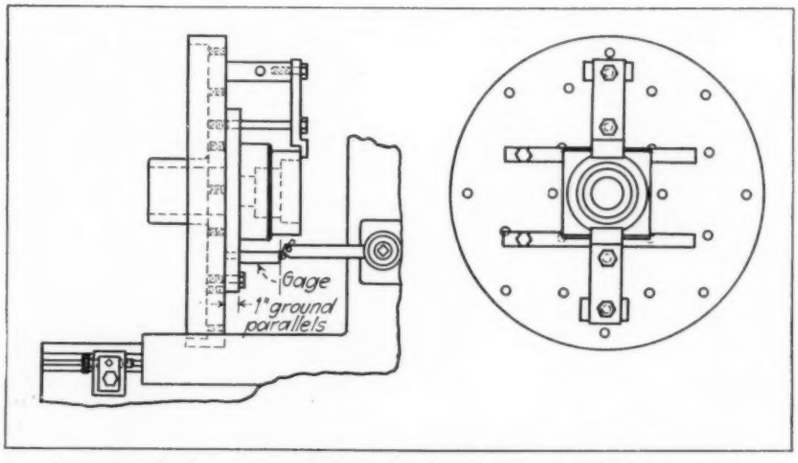
Faceplate Bolts

F. RATTEK

Noticing the statement by H. R. Hageman in an article under the above title (*AM*—Vol. 81, page 702) that special nuts are preferable to special bolts for faceplate work, one might question whether or not all has been said regarding faceplate bolts. The reference to nuts having tongues or pins to prevent them from turning and using capscrews instead of bolts strikes me as being a good idea. The lathe carriage can then be operated close to the work and the tools will have less overhang, hence greater rigidity.

The accompanying sketch shows the details of a plan worked out by our diemakers. A special faceplate, minus the conventional slots, is drilled and tapped in various places for $\frac{5}{8}$-in. capscrews. Parallels ground in sets to 1 in. in thickness are used for blocking so that the tool can be set to size blocks resting on the parallels for machining the inner faces of work at various depths. Diemakers on medium size work are delighted to operate a lathe with such a special faceplate, clamps and blocking.

With the old-style bolts, nuts, clumsy clamps and wooden blocking, the lathe man clamping work to the faceplate would need a helper. But with the faceplate illustrated equipped with special clamps and blocking, it is an easy job to hold the work with one hand and adjust the clamps, bolts and blocking with the other.



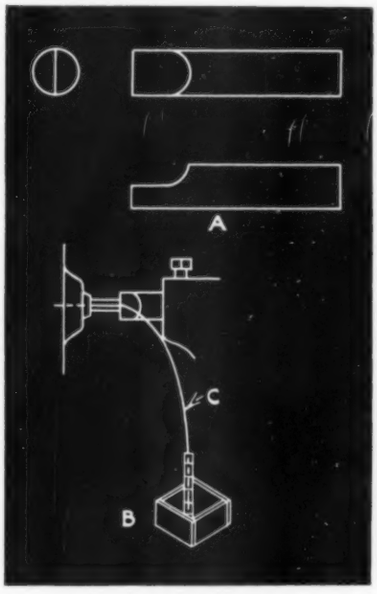
Instead of having the usual slots, this faceplate is drilled and tapped in various places so that capscrews can be used for tightening the clamps.

Half-Surface Stop Saves Time

H. H. NIEMANN
Time Study Engineer
Prentiss Wabers Products Company

In cutting off spacers and washers from tubular stock in the screw machine, much time can be saved in counting the product by using the half-surface stop *A* in connection with a piece of piano wire and a container. When the end of the tubular stock is in contact with the stop, one-half of the hole is covered while the other half is open. A piece of piano wire is inserted in the half-hole extending into the tube beyond the chucking surface, the lower end being inserted in a hole in the side of the container.

When a piece is cut off the chips drop into the machine pan and the piece slides down the wire to the container *B*. When the wire *C* is full of pieces the operator counts them and then withdraws the lower end of the wire from its hole and lets the pieces slide into the container. Then he puts the end of the wire back into its hole and proceeds with the work.



The total number of the pieces cut off is the number the wire will hold multiplied the number of times it has been emptied

When the wire is again full it is not necessary for the operator to count the pieces. To find the total number of pieces cut off, all that is necessary is to keep track of the number of pieces held by the wire in the first place and to multiply it by the number of times it has been emptied.

Making Screws Fit Tight

C. A. MOWREY
DuMaurier Company

A short time ago we had occasion to use some 3-48 stock screws to be screwed into the wall of a tube, the wall being but 0.032 in. thick.

After tapping one tube and trying in the screw, we found that it was too loose, so we tapped the remaining

tubes with a 3-56 tap, using the 3-48 screws as before. The difference in the pitch of the threads made a jam fit and the screws fit tightly, helping us out of our difficulty.

Dividers for Drawing Ellipses

ERNEST BLAKEMORE
Principal, Technical College
Railway Mechanics' Institute
Horwich, Lancashire, England

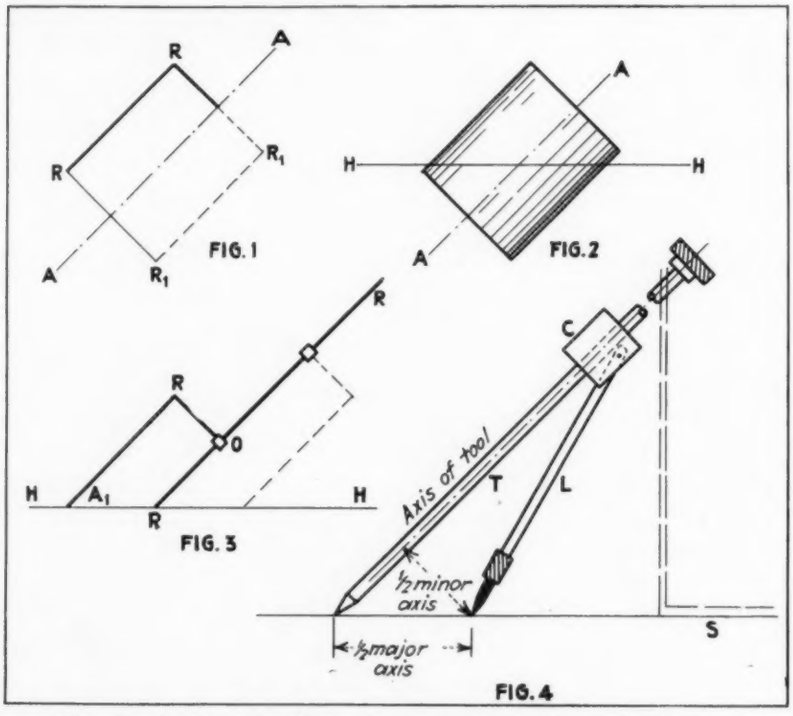
To draw ellipses of given dimensions many methods, mostly geometrical, have been developed. They all assume a fair knowledge of geometry and involve a considerable amount of laying out. But the tool herein described does away with the necessity for either. Its principle is easy to understand, its construction is very simple and its manipulation is no more difficult than that of ordinary dividers.

Dealing first with the principle, the rod *R-R*, Fig. 1, which is parallel with the inclined axis *A-A*, is capable of complete rotation about this axis, during which it will describe the cylinder $R\text{-}R\text{-}R_1\text{-}R_1$. If a horizontal section of the cylinder be taken as at *H-H* in Fig. 2, an ellipse is obtained, the minor axis of which is equal to the diameter of the cylinder and the major axis of which equals the minor axis divided by the sine of the inclination *A-A* from the horizontal. The point of interest derived from the above is that the locus of the point describing the ellipse is always on the surface of the cylinder. That means that if the point A_1, Fig. 3, be kept in a horizontal plane while it is made to revolve at a fixed perpendicular distance from the rod *R-R*, its locus will be an ellipse in the horizontal plane. The point *O*, however, will slide up and down the rod according to the change in position of the point A_1.

The necessary details of the tool are given in Fig. 4. A spindle *T* of square rod having a rather long and hardened point at the lower end, and a knurled knob at the top forms the axis, and a loose collar *C* with the pivoted leg *L* completes the unit.

To describe an ellipse of given dimensions, the spindle is held vertically and the leg *L* is set to one-half the minor axis of the ellipse. Without disturbing the angle between the leg and the spindle, the spindle is now inclined so that the point of leg *L* is at the outer limit of one-half the major axis. Holding the tool steady in that position, the leg is spun around by the spindle. If the collar to which the leg is pivoted is allowed to move up and down on the spindle without restriction, carrying the leg with it, the point of the leg will describe an ellipse of the required dimensions.

To make the tool more easy to use, a stand *S*, indicated by dotted lines, can be arranged with a V-notch on which to rest a loose collar on the spindle and so support the tool in the correct angular position.

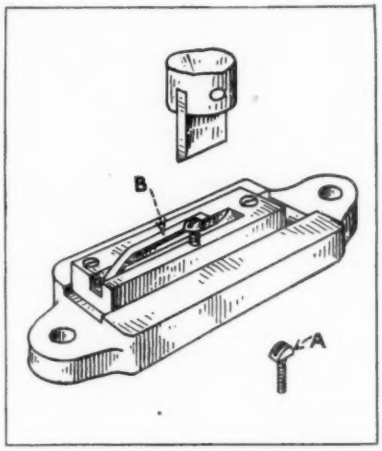


With this simple tool ellipses of predetermined major and minor axes can be drawn without any previous laying out to locate centers for dividers

Press Tools for Trimming Round-Head Screws

CHARLES H. WILLEY
Superintendent of Manufacturing,
Hoyt Electrical Instrument Works

In the recent change in our meters from stamped metal to molded bases, several thousand 1-in. by 10-32 round-head screws having one edge



There is just enough friction between the edge of the spring and the screw to prevent the screw from turning when struck by the punch

of the heads slabbed off parallel with the screwdriver slots, as at *A*, were required.

The tools for this operation, while very simple, have a kink in their design that may be worth adding to the shop notebook. It was necessary that the trimmed edges be fairly parallel with the screwdriver slots, and it was also important that the screws be raised out of the die after being trimmed so that the operator could flip them out with a small hardwood stick. Incorporating the spring *B* in a milled slot in the die did the trick.

The distance from the outside of the screw bodies to the trimmed flats is but $\frac{1}{64}$ in., while the distance from the edge of the body-size hole in the die to the edge of the spring is but 0.010 in. This difference makes just enough friction between the screws and the spring to prevent the screws from moving when the punch strikes their heads. No doubt some readers will say that a spring-operated plunger would be better than the spring, but this arrangement did the work at small cost for the tools.

The chip guard is mounted on casters and can easily be rolled into place. The chips hit the safety-glass screen and fall into a trough

Chip Guard for Shapers

GORDON W. RICHARDS

Toolmakers in a local shop need no longer give a wide berth to shapers that are running for fear of being struck by flying chips. For now each shaper has a chip guard that when rolled into position not only stops the flight of chips, but deposits them in a trough in the bottom.

Mounted on casters for free movement, the guard is largely made from welded angle iron. The upright guard plate *A* is a sheet of safety glass and, while serving to stop the flight of chips, permits full visibility. Chips hitting the glass plate fall into the trough, which is made of light sheet-metal. The trough is detachable and is easily dumped when full. This device saves a great deal of floor sweeping and serves to keep the toolroom tidy. It might be added that the chip guards were made by apprentices in the shop where they are used.

Low-Cost Snap Gage

IRA S. WILLIAMS

In an article under the above title (*AM*—Vol. 81, page 744), Hector J. Chamberland describes what he calls a low-cost snap gage utilizing a hardened and ground steel beam and gaging inserts of high-speed steel.

I fail to see how such a gage can be classed as low cost. Grinding a steel beam of thin section and any great length entails a difficult job and, unless the strains are removed, it isn't apt to stay straight for any length of time. I would suggest machine steel for the beam, either casehardened or soft, and for the sake of economy the grinding operation could well be omitted. When casehardened, machine steel will stay straight for a protracted period unless it is subjected to abuse, and will not fracture in the hardening process or be broken if accidentally dropped.

Regarding the high-speed steel gaging inserts, there is no advantage in using high-speed steel, as carbon steel is just as hard and can be ground or lapped to a better finish, insuring a better bearing surface and a longer life. The advantage of high-speed steel lies in its ability to stand higher temperatures and not in its relative hardness as compared to carbon steel. The inserts can well be made of machine steel, pack-hardened and then ground in place. The only advantage of making them of carbon steel is that after they have worn beyond the permissible limit they can be annealed, peened adjacent to the gaging surfaces to compensate for the wear, rehardened and again ground to size.

Tester for Driving-Box Grease-Cellar Springs

FRANK C. HUDSON

One of the factors affecting proper lubrication of driving axles is the strength of the spring in the grease cellar beneath the axle. In order to test these springs there is a very simple device used as shown by the Chesapeake & Ohio Railway Company.

It consists of a *U* frame of $\frac{3}{4}$ x 3 in. steel with a plate of $\frac{3}{8}$ in. steel, 10 x 14 in. welded to it to form a table. A bushing in the upper arm guides a $\frac{3}{4}$-in. plunger which has a $5\frac{1}{2}$-in. contact plate on the bottom and a 6-in. plate on top to hold the test weights. This has a raised central portion that centers and holds the test weights, shown at the right. Sizes and weights are given on the drawing and in the table. The last column of the table shows the correct compression of the springs under the different weights. The 2-lb. weight should compress the spring 1 in. and the 25 lb. weight 4 in. The dimensions of the weights may be useful in the testing of other springs.

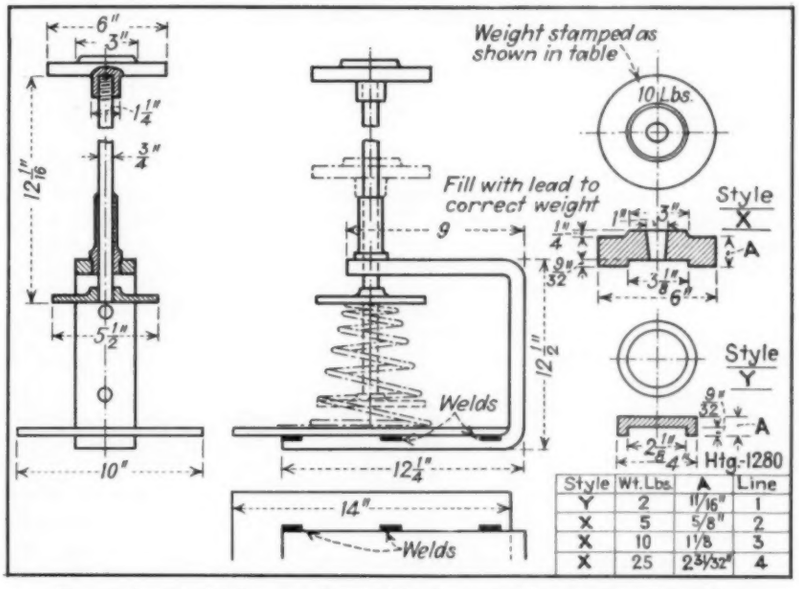
Air-Operated Milling Fixture

J. R. WHITTLES

In the illustration is shown a fixture for holding a number of round pieces while the ends are being slotted. The workpieces, shown in heavy dotted lines, are placed between the hardened V-blocks *A* which are free to slide on the base, being confined thereon by the plates *B*. The V-blocks are slightly rounded at the ends *C* to permit each individual block to swivel in adjusting itself to workpieces of slightly varying diameter.

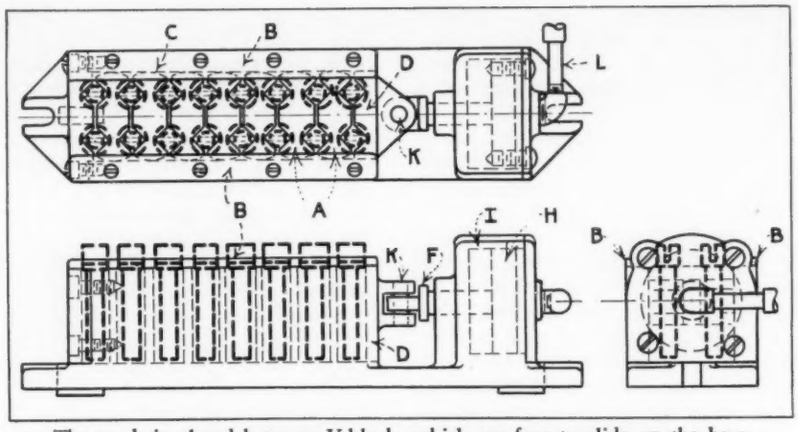
The end block *D* is free to slide and is coupled to the piston rod *F* of the piston *H* which travels in the air cylinder *I*. End block *D* has lugs for coupling the piston rod by the pin *K* through a hole therein.

Air under pressure of about 100 lb. per sq.in. is admitted to the rear of the cylinder through the pipe *L*



Style	Wt. Lbs.	A	Line
Y	2	11/16"	1
X	5	5/8"	2
X	10	1 1/8	3
X	25	2 3/32"	4

Two styles of weights may be used in the tester for grease-cellar springs



The work is placed between V-blocks which are free to slide on the base and is clamped by air admitted to the cylinder under pressure

which is attached to the shop air line. When air is admitted to the cylinder, the piston moves forward and, the piston rod being coupled to the end block *D*, pressure is transmitted to the V-blocks, causing them to grip the work tightly. When air is let out of the cylinder by a valve not shown, the work is unclamped.

Safety Sleeve for Pneumatic Hammers

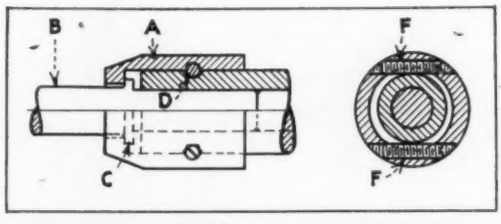
W. M. HALLIDAY
Peterborough, Northants, England

The use of pneumatic hammers is usually attended with some risk of accident and injury by the tool being forcibly ejected as the result of accidental pressure on the starting trigger. Hazards of that nature may, however, be averted by the use of the safety sleeve illustrated.

The sleeve *A* is bored at its front end to a diameter about $\frac{1}{16}$ in. larger than that of the shank of the tool *B*, the opposite end being bored for a slip fit over the barrel of the hammer, the juncture of the two bores forming a square shoulder. Bearing against the shoulder is the ring *C* which is welded to the shank of the tool.

An annular groove *D* having flaring sides is cut in the outside of the hammer barrel. The sleeve is drilled and tapped for the two screws *F*, care being taken to locate the holes so that the bodies of the screws will engage the groove for a depth equal to half their diameter. Section *X-X* illustrates the method of retaining the sleeve on the hammer barrel.

To assemble the device, the tool is inserted in the hammer and the sleeve is placed on the barrel. When the holes for the screws are brought fair with the groove in the barrel, the screws are inserted and screwed in, thus preventing the sleeve from coming off. The screws are loose enough in the groove to permit rotation of the sleeve. About $\frac{1}{4}$ in. is allowed between the ring on the tool and the inner shoulder in the sleeve.



The tool is retained by a ring on its shank being engaged between the inside shoulder of the sleeve and the end of the hammer barrel

Cutting-Off Tool

PETER VEIT
Foreman, Washington Iron Works

Referring to the cutting-off tool described by P. K. Rhinehart in an article under the above title (*AM*—Vol. 81, page 744), I have been using tools of that type for about fifteen years for cutting grooves.

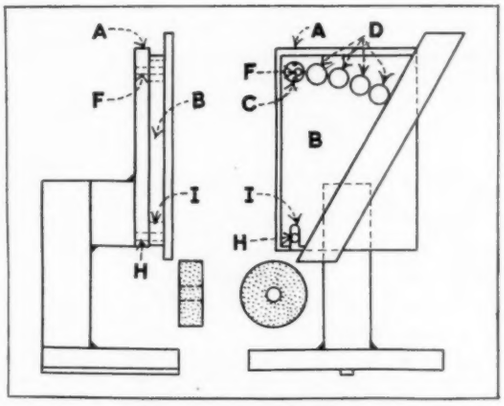
The tool has one fault for grooving. If the front face is flat, the bottom of the groove will be slightly convex. To make the bottom of the groove flat it is necessary to slightly round the front face, and the difficulty will be overcome.

Overhung Fixture for the Surface Grinder

JOHN E. HYLER
R. G. Le Tourneau, Inc.

The fixture illustrated is for grinding the ends of fairly long work, either square or at an angle, and so held that the abrasive wheel passes under the surface to be ground. The fixture is fabricated by welding steel shapes together, making most of the members hollow, so that it is not so heavy as the illustration would indicate.

Generally, the faceplate *A* is at a right angle to the base, but it can be inclined to suit special work. To the faceplate is clamped the swinging plate *B* which can be adjusted by the eccentric bushing *C*. The bushing fits any one of the holes *D* and over the pin *F* which is screwed into the faceplate. Two small holes are drilled in the outer end of the bushing for a pin wrench for turning it. In turning the bushing there is, of course, an irregular motion imparted to the swinging plate so that it can not be pivoted at a fixed point. To allow for its irregular movement and pivot it, the pin *H* engaging the slot *I* is provided.



Ends of work can be ground either square or at an angle. The abrasive wheel passes under the surface to be ground

By providing a pin to fit them, the series of holes *D* can be used without the eccentric bushing for quick location of work in two or three positions for grinding as many surfaces on the end of a given piece.

When a fixture of this type is designed for general work, it would be better to have a circular slot instead of the holes *D* and a clamp screw so as quickly to locate and clamp the plate at any point within its range. The right-hand edge of the swinging plate can be used as a guide for locating straight work.

Machining Silicon Bronze

SILICON BRONZES have strength, hardness and toughness, besides familiar corrosion resistance of copper alloys. They may contain from 1.5 to 4 per cent silicon, lesser amounts of manganese, zinc, lead or tin, and the balance copper. Representative trade names are Duronze, Everdur, Herculoy and Olympic.

Tensile strengths of silicon bronze range from 20,000 lb. per sq. in. for tank stock for unfired pressure vessels to 145,000 lb. per sq. in. for No. 20 gage hard-drawn wire, but cold working will raise the tensile strength to 160,000 lb. per sq. in. in some cases. Obviously a material that may have a tensile strength of 55,000-65,000 lb. per sq. in. in the fully annealed condition will not machine like free-turning brass.

Cutting Speed Range

The commonly recommended range of turning speeds for silicon bronze is 75-150 ft. per min. as compared with 450-650 ft. per min. with some cutting materials on free-turning brass. Ordinarily, the non-leaded silicon bronzes are considered to have a relative machineability of 30, based on 100 for free-cutting brass. The leaded silicon bronzes have a relative machineability of 60. Considerable deviations from these figures may be encountered in any one operation of turning, drilling, milling or sawing. Obviously, the characteristics of the alloy in hand must be determined carefully.

Cold working increases the hardness of some of the silicon bronzes without materially decreasing their toughness. Therefore, second cuts may be somewhat more difficult to make than first cuts.

Considerable heat is generated in cutting these materials, and suitable coolant must be employed. Some discoloration may be experienced if sulphur-bearing cutting compounds are used. Such discoloration is removable if not too deep by soaking the pieces in 10 per cent solution of sodium cyanide. If too deep, acid may be required. It is only fair to say, however, that manufacturing processes for oils with sulphonated fatty bases have been improved to such an extent that discoloration of the copper alloys by certain of these products is no longer to be feared. Most authorities agree, however, that oils having such refrigerant bases are best removed as soon as possible after machining is completed.

Other coolants satisfactory for use in machining silicon bronzes are water-soluble oil or paraffin oil. For rough lathe, planer and shaper operations, water-soluble oil is mixed with water in proportions of one part oil to five parts water. One-half part of kerosene may be added. The paraffin oil should have a Saybolt viscosity of 100 sec. at 100 F. and to it 5 to 10 per cent of lard oil should be added.

High-speed steel or carbide tools are ordinarily used for machining silicon bronzes, but carbon steel has been employed for the freer cutting materials. Stellite may also be used.

Tool angles suggested by Chase Brass & Copper Company are: back rake, 10 deg.; side rake, 6 deg.; clearance, 10 deg. Bridgeport Brass Company finds that a back rake of 7 deg. is satisfactory for roughing tools and 12 deg. for finishing tools; side rake of 8 to 12 deg. for roughing tools and clearance of 8 to 12 deg. Form tools ordinarily have a back rake of 10 deg. and should be turned upside down on the rear cross-slide to allow the long chip to fall away. Because of the toughness of the chip it does not break up, but comes off in a long helix which is difficult to handle.

In drilling the silicon bronzes, it is necessary to keep the drill cutting constantly. If this is not done "glazing" and hardening of the work will make it difficult to resume cutting. Lubrication is important. Drills with narrow and polished "lands" or more properly "margin," should be used. These drills should have a short helix, but where drills with a long helix are used undercutting of the cutting edge will prove beneficial. For larger-sized holes, the use of oil-tube drills, that is, drills with lubricant supplied under pressure, is recommended.

Over-size Taps Needed

Tapping speeds are preferably held to not more than 20 ft. per min. High-speed steel taps with ground threads are considered necessary. Silicon-bronze has a tendency to squeeze in, and therefore taps should be furnished slightly over size on the pitch diameter to allow for this condition when tapping to gage size. Tap drills larger than standard are also recommended.

A three-flute tap may be used if the flutes are deep and the "lands" are narrow. One user of a considerable amount of silicon bronze has also obtained satisfactory results on taps under $\frac{3}{8}$ in. in diameter and

Table I—Speeds, Cuts and Feeds for Lathe Tools

Cut, In.	$\frac{1}{32}$	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$
Feed, In.	0.006	0.030	0.015	0.060	0.015	0.050
Speed (Ft. per Min.)	170	105	110	55	100	45

Table II—Speeds, Cuts and Feeds for Automatic Screw Machines

Type of Tool	*Width of Cut, In.*	*Feed In.*	*Speed, Ft. per min.*
Box Tool, roughing	$\frac{1}{32}$	0.005	80-100
" " "	$\frac{1}{8}$	0.004	80-100
" " finishing	0.010	0.010	80-100
Forming Tool	$\frac{1}{4}$	0.0008	80-100
" "	$\frac{1}{2}$	0.0005	80-100
" "	1	0.0003	80-100
Cut-Off Tool	$\frac{1}{8}$	0.001	80-100

Machining Silicon Bronze

finer than 24 threads per in. by grinding off two flutes from standard four-flute taps and narrowing the lands. A silicon-bronze manufacturer agrees that the lands should be narrow and says further that the flutes should be given a 10 to 15 deg. rake. A two-thread chamfer on the end overcomes work hardening of the material. Sulphurized oil, plentifully applied, is a satisfactory coolant.

Thread Chasers

Recommendations for thread chaser angles and speed of threading vary. One is that thread chasers have a back or rake angle of 20 deg. Speed of threading may be increased slightly over tapping because of easier removal of chips and application of coolant. On the other hand, a 10 to 15 deg. rake angle is thought sufficient by another informant, who further suggests a narrow land and a surface speed of 15 to 20 ft. per min.

As in drills and taps, narrow lands, or margin, and well-polished flutes are desirable in reamers.

Opinions concerning the milling of silicon bronze vary according to the maker involved. Data for Everdur are as follows: for Finishing Cuts-rake angle, 0-10 deg.; clearance angle-cutters over 3 in. diameter, 4-12 deg.; cutters under 3 in. diameter, 3-6 deg.; feed, 1-2 ft. per min.; speed, feet per min., 90-200, depth of cut may vary within wide limits; for Roughing Cuts-rake angle, 0 deg.; clearance angle, 8-12 deg.; feed, 10-12 ft. per min.; speed, 950 ft. per min. At high speeds the greater the helix and the feed, the greater should be the clearance. Use of a coolant is recommended.

Table III—Drilling Speeds and Feeds

Drill	*R.P.M.*	*Feed per Revolution*
1 in.		
$\frac{1}{8}$	1500	0.0025
$\frac{1}{4}$	900	0.003
$\frac{1}{2}$	400	0.005
$\frac{3}{4}$	275	0.008
1	125	0.010

Comparable data for milling Duronze are as follows: The use of coarse-tooth cutters is recommended especially on deep cuts as this will facilitate chip removal. A cutting rake of 10-15 deg. with a clearance rake of 10 deg. is desirable. A plentiful supply of a cutting lubricant or compound is required. If water-soluble oils are used, not less than one part soluble oil to five parts water should be used.

Face milling cutters should be designed with top and side rake. Avoid lands wherever possible. Alternate-tooth cutters with staggered teeth are recommended for deep cuts. Binding of the cutter should be avoided by making the cutter widest at the cutting edge. The circular slitting saw used for copper, ground concave on the sides for clearance with the alternate teeth chamfered, is a model type that can be used to advantage. Avoid lands when possible.

Milling Speeds

In general, a surface speed of 45 to 55 ft. per min. and a feed of 0.003 to 0.008 in. per tooth is suitable. This depends on the strength and rigidity of the milling machine and cutters. Cuts deeper than $\frac{1}{4}$ in. may be troublesome.

Acknowledgements for these data are made to: H. P. Croft, chief metallurgist, Chase Brass & Copper Company; R. S. Burr, service engineer, American Brass Company, and John L. Christie, metallurgist, Bridgeport Brass Company. Part of these data have appeared in the Metals Handbook, published by the American Society for Metals.

Table IV—Cutting Silicon Bronze with Circular Saws

Material	*Type of Saw*	*Type of Teeth*	*Size of Saw*	*No. of Teeth*	*Hook Angle*	*Rim Speed Ft. per Min.*	*Feed In. per Min.*	*Lubricant*
Sheet ¼ to 1 in	High Speed	Square Top	12 x ⅛	75	Radial	1000	5–10	*Compound
Rod-up to 1½ in	High Speed	Alternate Bevel	12 x ⅛	100–150	5–10 deg.	2000–3000	30	Grease stick
Rod-1½ to 4 in	Inserted Tooth	Alternate Bevel	16 x ¼	60	5–10 deg.	750	10–20	Compound
Rod-4 to 8 in	Inserted Tooth	Alternate Bevel	28 x ¼	80–100	5–10 deg.	500	10–20	Compound
Tubing-dia. up to 1 in.-wall up to 0.050 in	High Speed	Square Top	10 x $\frac{1}{16}$	200	5–10 deg.	3000–4000	50–100	Grease stick
Tubing-dia. up to 1 in.-wall up to 0.050–0.250 in.	High Speed	Square Top	10 x $\frac{3}{32}$	150	5–10 deg.	3000–4000	25–50	Grease stick
Tubing-dia. 1 to 3 in.-wall up to 0.100 in.	High Speed	Square Top	12 x $\frac{3}{32}$	150–200	5–10 deg.	2000–3000	25–50	Grease stick
Tubing-dia. 1 to 3 in.-wall 0.100–0.250 in.	High Speed	Square Top	12 x $\frac{3}{32}$	150–200	5–10 deg.	2000–3000	25–50	Grease stick
Tubing-dia. over 3 in.-wall over ¼ in.	Inserted Tooth	Alternate Bevel	16 & over x ¼ 3–4 teeth per in. diameter		5–15 deg	1000	10–20	Compound

* Compound made up as water emulsion of soluble oil. Use 10 per cent oil by volume with 1 lb. heavy soap for 20 gal. of compound.

INDUSTRIAL REVIEW

MACHINERY and machine tool business in October was definitely below expectations in every part of the country. Whether the stock market collapse is the cause of this condition or a result of it is anybody's guess, but it seems perfectly clear that lack of confidence in the Washington administration and in the future of business is at the bottom of most of the postponements and refusals to close. Builders of machine tools have a large enough backlog of orders to keep their plants occupied for the rest of the year but the drop in orders is resulting in a material improvement in delivery dates.

NEW ENGLAND business in machinery has been spotty, some distributors reporting better results in October than in earlier months, others saying that there is very little stirring. Distributors in the metropolitan area say that few large deals are in prospect but that single orders continue to come in with reasonable frequency. Philadelphia reports a larger number of individual machine tool orders than were taken in September but does not expect much activity until the turn of the year. There has been a considerable letdown in Pittsburgh reflecting the local trend in industrial activity. Here, too, prospects for 1938 are promising.

CLEVELAND reports very little change in the slow business that has been the rule for the last sixty days. October was little better than September. In Detroit the municipal election fight to keep U.A.W. from winning a political victory has apparently resulted in a considerable slowing up in equipment buying. Not much improvement is expected before the first of the year. Supplies are being ordered on a hand-to-mouth basis. Inquiries and orders are both off in Toledo although distributors there look upon this slump as temporary.

CINCINNATI expects a certain amount of business to be placed between now and the first of the year but is not counting on any very considerable volume. Foreign orders have helped out the bookings of several of the builders. In St. Louis little machine tool business is being offered and the expectation is that there will not be much change before the first of the year. A number of new lists are being prepared in Chicago where business has been spotty and the total volume is less than it has been for some months. On the whole the situation might be a lot worse. Business in Milwaukee has been declining since the first of July and continued to do so in October.

WEST COAST DEALERS look for less total business this year than last, and optimism is diminishing.

CHIPS

Washington

James Roosevelt appointed by his father to coordinate activities of 18 federal boards . . . Kennedy announces regulations for wages and manning of merchant ships under federal control . . . Keel of new battleship is laid at New York Navy Yard . . . I.C.C. raises railroad freight income by $47,000,000, more increases under consideration . . . Roosevelt suggests farm bill that has all the outlawed provisions of A.A.A., insists act must not result in unbalancing of budget . . . Secretary Perkins asks states to look after unemployed not covered by Social Security Act . . . Roosevelt agrees to amortize cost of Bonneville Dam in 40 years . . . Administration and its advisers study possibilities of revising undistributed profits, capital gains and labor relations acts to stimulate business recovery . . . Public utilitys plan attack on confiscatory taxation.

Foreign

Duke of Windsor visits German factories, has tea with Hitler at his villa . . . Italian move saves Spanish conference from failure but promises long drawn out discussions before any foreign volunteers are withdrawn . . . Insurgents capture Gijon, completing their conquest of northwestern Spain . . . Italy puts 10 per cent levy on industrial and business concerns to raise money for Ethiopian exploitation . . . Brazil claps tight censorship and martial law on Rio Grande do Sul province . . .Soviet executions continue steadily . . . British anti-aircraft guns fired at Japanese planes over settlement territory, one brought down, feeling tense, American troops ordered to fire at attacking planes . . . Chinese retire from Chapei area after 78-day defense . . . Airplane bombs French ship off Spain, crew rescued . . . Nazis and Fascisti will continue support of Franco . . .Schacht resigns as German finance minister.

Finance

Stocks sag again after brief revival . . . Europe does not believe there will be a serious depression here . . . Federal Reserve Board cuts margin requirement to 40 per cent.

Industry

More than 5,000,000 automobiles built in 1937 model year, prospects for 1938 not so bright . . .A.F. of L. union wins election in Pennsylvania electrical manufacturing plant where C.I.O. had challenged court order upholding closed shop contract and had been sustained by N.L.R.B., Board sustains vote . . . Stettinius to succeed Taylor as U. S. Steel chairman, Irvin becomes vice-chairman, Fairless president, common dividend voted . . . A.F. of L. surprised by C.I.O. demand for autonomy and recognition of industrial unions, acceptance unlikely . . . Armco to continue present steel prices through first quarter of 1938.

Indicators

Steel production drops below 60 . . . Electric power output higher but daily average drops . . . National Metal Trades labor barometer stationary in September . . . *Business Week's* index off a point to 68.5.

WATCHING WASHINGTON

Margins cut seen as olive branch to business . . . Surplus tax may be modified . . . Educational orders bill to be pushed . . . $1,000,000 yearly to be asked . . . Federal deficit bigger than anticipated

WASHINGTON — Most significant slant on the Federal Reserve Board's action reducing margins on security purchases from 55 to 40 per cent was an indication of the Administration's willingness to do something for business in the face of a trade slump. Despite theories and idealistic objectives, new Dealers well know that nothing succeeds like prosperity and nothing is so devastating as a decline in business during an important election year.

Just what else will be done for business is still a subject of conjecture. The chances are that Congress will do something about the soak-the-surplus tax to make it possible for small and medium sized concerns to expand out of profit or at least to pay off their debts. More unlikely is that it will take any action on the capital gains tax. The prevailing view in administration quarters is that the clamor for change in this tax is rich man's talk. It is pointed out that this is a tax in which the little fellow is not concerned. Any man with a comfortable income will seize an opportunity to make a profit despite the capital gains tax, it is argued.

Ordnance Orders for Industry

Still another way in which government may help business is by placing educational orders, so that private manufacturers may become familiar with the production of materials needed in war. A request for an appropriation for educational orders of ordnance materials has already gone to the Bureau of the Budget. This is the first straw in the wind to indicate the launching of an armament program by the United States.

While division of opinion still exists among members of the Military Affairs committee of the House as to its merit, Representative J. Joseph Smith, of Connecticut, believes the turn of world events insures a favorable report on a bill he has sponsored on educational orders. Because such an order does not have to be awarded to the low bidder, Representative Smith was not able to get his bill to the committee last session.

The bill also provides for the accumulation by the government of complete sets of the necessary "gages, dies, jigs, tools, fixtures and other special aids and appliances." While the title to this equipment would remain in the government, the tools would be distributed to plants where orders would be placed. Not more than one educational order for the same article would be placed with the same manufacturer.

DOUBLE HEADER AHEAD

It will be the score of the Supreme Court enlargement fight, not the fighting coalition which so spectacularly defeated President Roosevelt on that issue, which will be important in the extra session about to start and the regular session into which it will merge.

The coalition will not and cannot stand together. It was united on a single issue. The mere fact that it went so far in opposing the President on that issue will make some of its members anxious to present to their constituents a little display of party regularity from now until the primaries which range all the way from early spring to late autumn.

As demonstrated last session, conservative southerners actuated more by local interest than by economic idea are in the saddle in the Rules Committee. Nearly every bit of legislation must get the approval of the Rules Committee if it is to have any chance in the House. This committee brings out a special rule for each bill, limiting debate, and providing for a vote. Without such a special rule, action is well nigh impossible. Of course, a majority of the House can vote down a rule, or vote to bring any measure out over the Rules Committee's head, but that just doesn't happen.

So the double-header session of Congress, so soon to start, promises not only a lot of interest, but perhaps a coming events shadow forecasting history.

In the bill considered by the Military Affairs committee at the last session, provision was made for an appropriation of $2,000,000 during each of five succeeding fiscal years. The Bureau of the Budget refused to approve that amount, but an agreement has just been reached between the Budget Bureau and the chief of staff of the Army, under which $1,000,000 a year for five years will be authorized. With this important hurdle out of the way, Representative Smith expects to press his bill on the first day of the extra session to convene November 15.

Federal fiscal difficulties were emphasized in the President's latest statement on the budget in which he predicted a net deficit for the year of $695,000,000, or $277,000,000 more than he estimated six months ago.

Outgo Up—Intake Down

Both sides of the balance sheet proved to be erroneous in the estimate made last April. Revenues expected now seem to be $256,000,000 less than predicted this spring, while government savings have failed to materialize. Despite this rather gloomy picture the President reaffirmed his hopes of balancing the budget.

Corcoran and Cohen, drafters extraordinary of legislation for the administration, are preparing a bill providing for the registration and regulation of trade associations. Whether the proposal is to be pressed for passage or simply to be used if there is an attempt in Congress to require the responsibility of labor unions has not been revealed.

Meanwhile, organized labor seems to be making little progress in its attempt to present a united front. Peace negotiations between the C.I.O. and the A.F. of L. struck a snag when C.I.O. demanded autonomy as the price of coming back into the fold. The Lewis group insisted that the A.F. of L. yield full control over all mass industries as the price of reunion, a proposal which A.F. of L. representatives termed as absurd.

In all of the southern states chambers of commerce, manufacturers associations, and committees of the southern pine industry committee are holding meetings in opposition to wage-hour legislation.

In New Orleans and other cities, newspapers are running page ads, paid for by contributions and written by the pine industry committee.

HOWARD W. DUNBAR

N. A. WOODWORTH

T. H. DOAN

Howard W. Dunbar Elected President of Machine Tool Builders' Association

Prospects for the immediate future of business came close to monopolizing informal discussion at the 36th annual meeting of the National Machine Tool Builders' Association at Hot Springs, Va., October 25-27. Insofar as the machine tool builders are concerned the question is somewhat academic except as to new orders. Most of them still have plenty of business to occupy them well into 1938. Attendance was better than normal with 115 members and 60 ladies and guests. A high spot of the banquet was the celebration of the 76th birthday anniversity of William A. Viall, vice-president, Brown & Sharpe Mfg. Co. This anniversary occurred on Tuesday.

In the presidential address of Clayton R. Burt, which is printed on pages 1023 and 1024, emphasis was laid on legislative and administrative handicaps that had been placed on industry during the past five years. The need for some modification of these restrictions was clearly pointed out. At the same session general manager Tell Berna reported on the work of the association and James A. Emery, general counsel, National Association of Manufacturers, outlined what has already taken place in federal regulation of private employment and warned of the possible evil effects of a contemplated wages and hours bill.

Dr. Lewis Haney, professor of economics, New York University, opened the afternoon session with an analysis of the business situation in which he pointed out the existence of certain favorable factors that may well reverse the present downtrend of the business curve rather promptly. In the absence of Raymond Moley, editor, News Week, who was to have spoken on the national outlook, Kenneth H. Condit, editor, American Machinist, presented briefly the results of the study to estimate the percentage of obsolescence of machine tools as of July 1, 1937. This study was printed in American Machinist for October 20 on pages 964 and 965. In the evening Igor Sikorsky, engineering director, Sikorsky Airplane Div. of United Aircraft Corp., told of his early experiences with aircraft design and of his first attempts to fly, and led on from there into some statements as to the limits of weight and speed likely to be reached in airplane design.

New Directors Elected By N. M. T. B. A.

W. E. WHIPP

S. F. NEWMAN

H. W. WENDT

He pointed out that economic considerations would be the determining ones.

A business meeting elected as directors to serve for three years W. E. Whipp, president, Monarch Machine Tool Co.; S. F. Newman, vice-president, Landis Machine Co.; and Henry W. Wendt, chairman of the board, Buffalo Forge Co. The new board organized by electing as president Howard W. Dunbar, vice-president and general manager, Grinding Machine Div., Norton Co.; N. A. Woodworth, president, Ex-Cell-O Corp., as first vice-president, and Mr. Whipp as second vice-president. T. H. Doan, president Foote-Burt Co. was elected treasurer.

B. F. Fairless Heads Big Steel

Benjamin F. Fairless, formerly president of Carnegie Illinois Steel Corp., was last week elected president of the U. S. Steel succeeding William A. Irvin. At the same time it was announced that Edward R. Stettinius Jr., will become chairman of the U. S. Steel board on April 5, when Myron C. Taylor, present chairman will retire. Mr. Irvin is to become vice-chairman of the corporation; J. L. Perry, president of the Tennessee Coal, Iron and Railroad Co., succeeds Mr. Fairless as president of Carnegie Illinois.

Dr. Merica is Awarded John Fritz Gold Medal

For "important contributions to the development of alloys for industrial uses," Dr. Paul Dyer Merica, director of research, International Nickel Co., and vice-president of the International Nickel Co. of Canada, was awarded the 1938 John Fritz Gold Medal. Dr. Merica's research in theoretical and practical metallurgy has increased scientific knowledge in both ferrous and non-ferrous fields. The Board of Awards was composed of members of the A.S.E.E., the A.I.M.M.E. the A.S.M.E. and the A.I.E.E

Machinery Exports Rise

Foreign sales of ice-making and refrigerating machinery for the first eight months of 1937 had a value of $1,731,319, a gain of 42 per cent over the same period of last year. This marks a steady upward trend since 1933.

Industrial Relations Interest Massachusetts Manufacturers

BOSTON—About 1500 executives attended the one-day session of the Associated Industries of Massachusetts at the Copley-Plaza Hotel, Boston, on October 28. Highlight of the session was the dinner speech by William S. Knudsen, president, General Motors Corporation.

At the morning session, retiring president, Albert N. Murray, introduced Cyrus S. King, director of industrial and public relations, The United States Rubber Co., who spoke on "The Keynote of Employer-Employee Relations." Next speaker was Adam Wilkinson, well known former labor leader, who said that the Wagner Act was the signal for a huge organization of men in trade unions, and successful because such organization meant that they would be given a voice in wage rates and working conditions.

John F. Tinsley, vice-president and works manager, Crompton & Knowles Loom Works, in speaking on "Telling Industry's Story to Employees and the Public," stressed that industry must take its employees and the public into its confidence. Outsiders are likely to point to a good year's profits as excessive without realizing the losses or low rates of return in many other years.

Organized labor trends was the topic of Prof. Sumner H. Slichter, of Harvard Graduate School of Business Administration. Rep. Christian A. Herter spoke on equal responsibility of the unions.

George E. Sokolsky, author and lecturer, denounced John L. Lewis, the C.I.O. and manufacturers who have had any dealings with him. He urged manufacturers present not to sign a contract under any conditions and to let the unions fight themselves out. He also said the influence of the C.I.O. was waning, and this is concurred in by large employers of labor in New England.

William M. Rand, president of the Merrimac Chemical Co., was elected president of the association to succeed Mr. Murray. The executive committee is composed of Richard C. Greenwood, president, Haywood-Wakefield Co.; Ira T. Mosher, vice-president and general manager, American Optical Co.; L. F. Hosley, general manager of the Indian Motocycle Co.; and James Y. Scott, executive vice-president of the Van Norman Machine Tool Co.

Awards of merit were made to an imposing array of new products in the "Merit Court." The Norton Co. won nine awards covering: a coating for radio-tube filaments, high temperature furnace tubes, improved diamond wheel, an improved grinding wheel, a composite grinding wheel, an improved artificial pulp-stone, an improved hydraulic universal grinder, a crank and camshaft lapping machine, and a special grinder for diesel engine crankpins. Boston Gear Works received awards of merit for a meter gear box, a ratiomotor, a flexible coupling and a speed reducer.

Greenfield Tap & Die Corp. was given an award for development of "Maxi" high-speed steel taps, drills and reamers.

Jap Military Demands Ordnance Tools

TOKYO—Japanese machinery makers carry in hand forward orders to keep them busy for at least two years to come, but they are not disposed to adjust their productive capacity, according to "Diamond," organ of the Japanese heavy industries. The main reasons for the reluctance of machinery concerns to gear up production so as to meet the intensified demand, the paper explains, are cautious calculation in anticipation of a reactionary movement; difficulties in the providing of manufacturing equipment owing to rigid import control; and inadequate supply of skilled labor in Japan.

As a means of overcoming the situation, the government has been stressing the importance of specialization on the part of industrialists. Official quarters realize, however, that this is difficult in view of the limited market for Japanese machinery products. If things become more pressing, the industry may be compelled to extend operations, no matter if they like it or not. A large state-managed machinery plant, as suggested in some quarters, may be useful inasmuch as it could specialize in large sizes, manufacture of which private makers are loath to undertake. At such an institution, research and experimentation may be conducted on a large scale to serve the interests of the whole industry, it is pointed out. But beyond that "Diamond" sees little use for a government-managed machinery enterprise.

G. B. Waterhouse Assumes A. S. M. Presidency

New officers of the American Society for Metals assumed their responsibilities at the annual meeting in Atlantic City, October 18-22. George B. Waterhouse, professor of metallurgy, Massachusetts Institute of Technology, succeeds Dr. Edgar C. Bain, assistant to the vice-president in charge of metallurgy, United States Steel Corp., as president of the Society.

Mr. Waterhouse is succeeded as A.S.M. vice-president by W. P. Woodside, vice-president of the Climax Molybdenum Co. Dr. Bradley Stoughton, dean of engineering, Lehigh University, becomes treasurer for two years.

New trustees of the society are James P. Gill, metallurgist, Vanadium-Alloys Steel Co., and Harvey Anderson, metallurgical engineer, Western Electric Co.

The 1937 Edward De Mille Campbell memorial lecture was presented by Wesley P. Sykes, metallurgical engineer, Cleveland Wire Works, General Electric Co. Mr. Sykes' lecture was "Structural and Hardening Characteristics of Some Iron-Cobalt-Tungsten Alloys."

During the annual banquet the past-president's medal was presented to R. S. Archer, chief metallurgist, Chicago District, Republic Steel Corp., who served in 1935-36. The medal was presented by retiring president Dr. Bain. He also gave the Henry Marion Howe gold medal to A. G. H. Andersen, research department, Phelps-Dodge Corp., and Eric R. Jette, associate professor of metallurgy, School of Mines, Columbia University. This medal is awarded for the best paper published in the society's *Transactions*.

F. E. Hodek, Jr. Heads Porcelain Enamel Group

Executives from member companies of the Porcelain Enamel Institute held the seventh annual meeting on Oct. 11-12 in Chicago. A new program involving expanded research activities will be undertaken. Officers elected for the coming year are: F. E. Hodek, Jr., General Porcelain Enameling & Mfg. Co., president; H. D. Chase, Chicago Vitreous Enamel Product Co., vice-president, in charge of advertising and promotion; Richard H. Turk, Porcelain Enamel & Mfg. Co., vice-president in charge of research.

Lincoln Gold Medal Presentation—**T. M. Jackson, right, received the first award of the Lincoln gold medal from Col. G. F. Jenks, chairman of the award committee of the American Welding Society. Rear row—E. R. Fish, a new director, A. E. Gibson, retiring president and Miss M. M. Kelly, secretary.**

Welding Society Elects Philip G. Lang

Philip G. Lang, Jr., engineer of bridges, Baltimore & Ohio Railroad, was elected president of the American Welding Society, at the eighteenth annual meeting in Atlantic City, October 18-22. Mr. Lang succeeds A. E. Gibson, president of the Wellman Engineering Co., Cleveland. New directors are E. R. Fish, chief engineer, boiler division, Hartford Steam Boiler Inspection & Insurance Co.; J. H. Deppeler, chemical engineer and works manager, Metal & Thermit Corp.; A. M. Candy, consulting engineer, Hollup Co.; A. E. Gaynor, John A. Roebling's Sons Co., and E. L. Mathy, first vice-president, Victor Equipment Co.

H. Sidney Smith, consulting engineer for the Prest-O-Lite Co., and well known in the acetylene industry both in the United States and abroad, was awarded the Samuel Wylie Miller memorial medal for meritorious contributions to the science and art of welding.

The first presentation of the Lincoln gold medal was made to T. M. Jackson, chief electrical and welding engineer, Sun Shipbuilding & Dry Dock Co., for his paper "Welding in Tanker Construction," judged the best paper on welding published in the society's journal during the past year. The award was presented at the Monday session, October 18.

O. T. Muehlemeyer Heads Commercial Heat-Treaters

The annual meeting of the Metal Treating Institute was held at the Ambassador Hotel, Atlantic City, on October 18, in conjunction with the National Metal Congress. The following officers were elected: President, O. T. Muehlemeyer of O. T. Muehlemeyer Co., Rockford, Ill.; vice-president, C. G. Heilman of Commonwealth Industries, Detroit; secretary and treasurer, Roy Lindberg of A. M. Lindberg Co., Chicago.

Messrs. Muehlemeyer, Heilman and Lindberg were also elected to the board of directors. Other directors are: A. D. Bach, New England Metallurgical Corp.; Kenneth Stumpf, Stanley P. Rockwell Co., Hartford; A. M. Cox, Pittsburgh Commercial Steel Treating Co., Pittsburgh, and Clifford Scott, Jr., of C. U. Scott & Son Co., Rock Island, Ill.

DETROIT LETTER

Auto Makers Expect to Sell Four Million Cars Next Year . . . Much Equipment Will Be Bought During 1938 . . . Ford Is Purchasing Machinery . . . Labor Trouble Threatens As C.I.O. Tries to Revive Lagging Interest

DETROIT—The stock market collapse has left automotive executives in a fog. They aren't so sure as they were regarding the number of cars that they will sell during the 1938 season and some of them who publicly set high sales quotas for the coming year now privately wish that they had kept silent. The consensus of opinion is that the industry will do well if it builds four million units next year as against better than five millions this year. That represents a drop of half a million units from former estimates.

At least one large company is starting out with no intention of trying to predetermine its volume for '38. It has decided that the only sensible thing to do is to go along conservatively and make its plans from month to month. Meanwhile it is keeping its production organization as flexible as possible so that it can move the rate of output up or down rapidly.

Car makers have their eyes chiefly on retail sales figures to find out how much sales resistance has been built up by higher prices. Car prices have been advanced more than the industry would like the public to think, if comparisons are made with last spring instead of with August, after the first increases had been put into effect. The advances range from 7 to 16 per cent. Ford's models are up 8 to 13%. One maker, Hupmobile, has taken some of the gadgets off its six and thereby reduced the price so that it delivers in New York for around $1,000.

Expect Large Outlays

Even if car production next year should be a million units less than this year, the industry's expenditures for new equipment are expected to be large. Mechanical changes alone in 1939 will be responsible for much machine tool buying; two companies already are in the preliminary stages of designing new motors to be put into '39 cars. Then the problem of keeping down labor costs will be an influential factor in the purchase of new equipment.

Despite the scare of another depression, Ford is proceeding with its forty million dollar expansion program and also is spending additional large sums to install cost-reducing machinery and to bring all departments of the Rouge plant up to a point where some 7000 units can be turned out in a 16-hour day. Much money has been spent the past two years in providing further equipment to put all departments on a two-shift basis, but some departments have been so busy that they have been compelled to operate 24 hours a day. The present program will serve to relieve that congestion.

Buys on Three-Year Basis

Another of the industry's large companies is committed to a policy of buying equipment which can pay for itself over a three-year period. For about two years it has had this policy, which isn't so stringent as its previous policy which stipulated that machinery must pay for itself in 12 months. The management does not contemplate any change in its present policy even if business should dip considerably the coming year.

In some cases General Motors is drawing parts manufacture from outside sources into its own plants and in other cases it is doing just the opposite so that one would seem to balance the other. Because running boards are destined to disappear from cars in the next few years, the Inland Mfg. Co., G. M. division at Dayton, Ohio, has begun to make clutches in addition to running boards. This will help to stabilize production and employment at Inland as the volume of running board business declines. Without any flare of publicity General Motors has taken into its own factories much carburetor production heretofore done outside.

A prominent G. M. car division, on the other hand, has decided that if it should need more volume of any parts aside from engines, axles and bodies, it will place the work outside rather than add further capacity in its own plants. Its management makes the point that cast and forged parts can be purchased outside just as cheap as they can be produced in the company's own factory and perhaps cheaper. One reason is that the wage levels in many parts factories are much lower than in the plants of car makers.

Labor Trouble Threatens

Detroit is as much aroused over threatened labor trouble as it is over what may happen to retail car sales. The feeling is that the United Automobile Workers are waiting until the municipal election is over to begin agitation which may lead to strikes.

Reports are that the U.A.W. is having a whale of a time collecting dues. A time-tried method of reviving the lagging interest of unionists is to make demands on a company and then follow them up with a strike. Following this ancient pattern, the U.A.W. appears today to be spoiling for a fight. General Motors, despite its union agreement, will not be immune. Votes giving their officers the authority to call a strike have recently been taken at the Ternstedt and Fisher 23 plants in Detroit.

A labor storm appears to be gathering at Dearborn, but how soon it will break is a matter of conjecture. Just what procedure the U.A.W. will take isn't known, but presumably they will try to tie up Ford branch assembly plants and factories of Ford parts makers. The union is weakest at the Rouge plant.

The New York show opened last Wednesday with the usual ballyhoo. As previously pointed out in this column, there is little new for 1938. The three new cars from an appearance angle are Graham, Lincoln-Zephyr and Cadillac 60. Ford has made the front end of its standard line different from that of its de luxe models, the standard being available with both the 60-hp. engine and the 85-hp. engine. Most effort has been put by the industry on adding to the refinements inside the car to make it more comfortable for driver and passengers.

The Detroit tool and die trade is almost flat, now that car makers have actually launched new models. Local shops are anticipating the placing of 1939 programs much earlier than usual, partly because widespread changes are looked for.

Alfred H. Werner Made Strip Mill Superintendent

Carnegie-Illinois Steel Corp., Pittsburgh, has appointed Alfred H. Werner, superintendent of the hot strip mill, Irvin Works. Mr. Werner was formerly foreman at the 43-in. strip mill of the McDonald, Ohio, Works. John H. Elliott has been made tin-finishing superintendent. He was formerly assistant general superintendent of the Shenango Works, New Castle, Pa.

The Corporation has also appointed Henry C. Ford as superintendent of the production and shipping department at the Irving Yorks. Mr. Ford acted as assistant to the general superintendent, New Castle Works, before his present appointment.

Marketing Conference Staged for New York

The Marketing Division of the American Management Association will hold a conference along "laboratory lines", November 18-19, at the Hotel Pennsylvania, New York. The conference has been designed to suit the needs of organizations selling in today's market and under present conditions. Among the speakers will be Harry B Brown, of Philco Radio & Television Corp.; J. M. McKibbin, Jr., Westinghouse Electric & Mfg. Co., and Robert F. Lovett, Proctor & Gamble Co.

Equipment to Be Shown at Chemical Exposition

More than 300 exhibits will be on display at the 16th Exposition of the Chemical Industries, Grand Central Palace, New York, N. Y., December 6-11. The latest developments in chemical raw materials, consumer goods and plant equipment will be featured.

C. E. Bleicher Becomes De Soto Vice-President

Clarence E. Bleicher has been made vice-president and general manager of the De Soto Motor Corp. to succeed Herman L. Weckler, now vice-president of Chrysler Corp. in charge of industrial relations. Mr. Bleicher has been an operating executive on the staff of K. T. Keller, president of Chrysler.

Standards Association Will Meet December 1

Frank B. Jewett, vice-president, American Telephone & Telegraph Co., and president of the Bell Telephone Laboratories, will be guest speaker at the annual meeting of the American Standards Association, December 1, at the Astor Hotel, New York.

Hutto Division Sold by Carborundum Company

Assets and good will of the Hutto Machine Division of the Carborundum Co. have been sold to the Micromatic Hone Corp., Detroit, and the Barnes Drill Co., Rockford. The business will be subdivided by the purchasers. Barnes Drill Co. will absorb that part of the business relating to the manufacture, sale and service of honing machines and gear lapping machines.

Kirke W. Connor will serve as chief executive of the combined organizations.

PERSONALS

LOUIS A. ALMGREN, formerly chief tool designer of the Service Tool Die & Mfg. Co., Chicago, has joined the organization of the Tool Equipment Sales Co., 4625 Fulton St., Chicago, as a sales engineer, according to C. B. COLE, president.

PHILIP E. BLISS, president of the Warner & Swasey Co., Cleveland, has been made a trustee of the Case School of Applied Science. Mr. Bliss' appointment fills the vacancy left by the death of Ambrose Swasey last June.

D. D. FENNELL, consulting engineer in Chicago, has been elected president of the National Safety Council.

FRANK FIELDS has been made general manager of The Sidney Machine Tool Co. to fill the vacancy caused by the retirement of A. C. GETZ, who now assumes the duties of vice-president and will continue to be active with the company in that capacity.

HOWARD J. KAIGHIN has recently been elected president and treasurer of the American Welding & Mfg. Co., Warren, Ohio.

FRANK HARRISON, assistant works manager, International Harvester Co., was elected vice-president for industrial safety, National Safety Council, at the 26th National Safety Congress and Exposition.

CHARLES L. HUSTON, first vice-president of the Lukens Steel Co., was recently honored for being in his 62nd year of service with the company.

RALPH O. LAKIN, district manager at Indianapolis for the Allegheny Steel Co., died recently at the age of 45.

ALEXANDER W. LIMONT, JR., has been appointed manager of the Compressor Division, Sullivan Machinery Co., Michigan City, Ind. Mr. Limont has had broad experience in compressor problems and has been responsible for the development and application of compressors for many special uses. He goes to the Sullivan Machinery Co. from E. I. du Pont de Nemours & Co. He is a member of the A.S.M.E. Committee which establishes the codes for unfired pressure and external pressure vessels.

LOUIS F. POOCK, vice-president and general manager, Sheffield Gage Corp. and the Cimatool Co., Dayton, Ohio, has been made chairman of the Dayton-Columbus-Cincinnati Section, Society of Automotive Engineers.

GLEN H. TRESLAR has been made assistant sales manager of the Black & Decker Mfg. Co., Towson, Md., according to S. DUNCAN BLACK, president. Mr. Treslar has been with Black & Decker for over fifteen years and was recently supervisor of the Cleveland-Detroit areas.

OBITUARIES

Percy C. Brooks Dies

Percy C. Brooks, former executive vice-president, Fairbanks, Morse & Co., died in Chicago, Oct. 15 after an illness of about one year. He was 65.

Mr. Brooks started with the Atlanta Machine Works following graduation from the Georgia School of Technology in 1891. He began nearly 40 years association with Fairbanks, Morse & Co. in 1898, as assistant to the general manager at Beloit. He became manager of the Beloit plant and then manager of the Canadian Fairbanks-Morse Co. when that was organized in 1905.

WALTER F. BRINK, vice-president, The Engineering Specialties Co., died at the age of 37 in Detroit.

HARRY A. CLUM, founder and one-time president, Clum Mfg. Co., Milwaukee, died October 18, at the age of 72.

CHARLES R. GREUTER, 76 pioneer automobile manufacturer of Indianapolis, died recently. He was a mechanical engineer with the Stutz Motor Car Co., Matheson Motor Co., and Excelsior Motor Co. over a period of 40 years. He is credited with having built the first four-cylinder motor car in this country.

JOHN F. KELLER, steel expert and former president of the American Society of Steel Treating, died last week at the age of 75. At one time Mr. Keller was an instructor at Purdue University.

WILLIAM R. SWEATT, chairman of the board, Minneapolis-Honeywell Regulator Co., died Tuesday, Oct. 12.

BUSINESS ITEMS

Aerovox Corp., Brooklyn, N. Y., radio parts manufacturer, plans to lease 130,000 sq. ft. of floor space in the plant of the United States Rubber Co., Capitol Ave., Hartford, Conn.

The American Rolling Mill Co. will spend $2,000,000 to improve the Middletown, Ohio plant, according to CALVIN VERITY, executive vice-president. Open hearth practice will be improved through improvements to the furnaces, the addition of new furnace controls and other equipment. The blooming mill in the Armco plant will be motorized.

Carboloy Co., Inc., Detroit, manufacturers of cemented carbides, has purchased a 40-acre tract outside the city limits. It is planned to build a factory on this site to manufacture cemented carbide tools, dies and wheel dressers.

Approximately 30,000 sq.ft. of additional floor space will be provided by a manufacturing building under construction for the Detroit Rex Products Co., 13005 Hillview Ave., Detroit. This comcompany has also opened a branch office in the Provident Bank Building, Cincinnati, Ohio, to serve southern Ohio, Indiana, and northern Kentucky.

Graham Transmissions, Milwaukee, has appointed R. L. JOHNSTONE, 1407 North Hanley Road, St. Louis, Mo. to represent it. Other new representatives are CHARLES C. GRANT, 436 Second National Building, Akron, Ohio, and GEORGE P. COULTER, 322 Curtis Building, Detroit.

The Lincoln Electric Co., Cleveland, manufacturers of arc welding equipment, has appointed ARTHUR T. COX, JR., as manager of its Tri-Cities welding sales-engineering office at Moline, Ill.

The purchase of the modern factory buildings and 16-acre tract of Duesenberg, Inc., at Washington and Harding Sts., Indianapolis, as the new home for Marmon-Herrington Co., makers of all-wheel drive motor vehicles, has been announced by WALTER C. MARMON, chairman of the board. The company will move from its present location in the old Nordyke-Marmon plant and plans to be in full operation by December 1 in the new quarters. Much new equipment will be purchased.

Michigan Steel Tool Products Co., Detroit has begun a $100,000 building program to add 45,000 sq. ft. of floor space. A contract has been placed with the Austin Co. of Cleveland for the erection of two buildings. In addition, a bright annealing furnace for normalizing steel tubing will be installed.

Packard Motor Car Co., Detroit, will build a $1,000,000 assembly plant at South Gate, Los Angeles, Calif. Work will start on the factory within 90 days.

Parker Rust-Proof Company is building additional office and laboratory facilities on East Milwaukee Avenue, Detroit, Mich. Adjacent to the present building, the new addition will be a two-story fireproof structure, 148 x 152 ft.

Lincoln Electric Co. has opened its 80x240ft. addition, which has "tree-form" columns and welded saw-tooth frame.

Pulver Machinists Supply Company is the new name for the concern formerly known as Pulver Machinists Tool Company located at 27-29 North Jefferson St., Chicago, Ill.

The C. F. Pease Co., Chicago has a new administration building and plant at 2601 West Irving Park Road.

The Roots-Connersville Blower Corp., Connersville, Ind., has announced appointment of two new exclusive distributors for its line of turbine pumps. Buffalo Mill Supply Co., Inc., 210 Main St., will cover the counties adjacent to the city of Buffalo. G. W. Hartfield is vice-president and sales manager. F. W. Allen & Son, 2658 W. 26th St., will cover the counties in Pennsylvania and Ohio adjacent to the city of Erie. Frank Allen heads the sales organization.

MEETINGS

AMERICAN FOUNDRYMEN'S ASSOCIATION. Joint conference with Buffalo Chapter and Cornell University, Nov. 26-27. Willard Straight Hall, Ithaca, N. Y.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting. New York, N. Y. December 6-10. Secretary, 29 W. 39th St., New York.

AMERICAN STANDARDS ASSOCIATION. Annual Meeting, Dec. 1. Hotel Astor, New York.

CHEMICAL EXPOSITION. Grand Central Palace, New York. Dec. 6-11.

INTERNATIONAL ACETYLENE ASSOCIATION. 38th annual convention. Birmingham, Alabama. November 10-12.

NATIONAL TRUCK SHOW. Fourth annual national motor truck show, November 6-12. Center Market Bldg., Newark, N. J.

SOCIETY OF AUTOMOTIVE ENGINEERS. National Production Meeting. Hotel Durand, Flint, Mich. Dec. 8-10.

PATENTS

October 12, 1937

Metal-Working Machinery

Bronzing Machine. Elmer W. Belluche, Racine, Wis., assigned to Christensen Machine Co., Racine, Wis. Patent 2,096,026.

Welding Process and Apparatus. Harry S. George, Massapequa, N. Y., assigned to Union Carbide & Carbon Corp., New York. Patent 2,096,171.

Unusual Spring Coiling Machine. William H. Blount, Worcester, Mass., assigned to Sleeper & Hartley, Inc., Worcester. Patent 2,096,605.

Parts and Mechanisms

Combined Tool Holder and Chip Breaker. Robert D. Shaw, Hartford, Conn., assigned to Niles-Bement-Pond Co., New York, N. Y. Patent 2,096,137.

Work Spindle for Thread Milling Machines. Robert R. Raber, West Hartford, and Frederick J. Larson, East Hartford, Conn., assigned to Niles-Bement-Pond Co., New York. Patent 2,096,134.

Charging Device for Pickling Machines. Agnes J. Reeves Greer, Morgantown, W. Va. Patent 2,096,512.

Processes

Method of Annealing and Apparatus Therefor. Lazenby C. Hamlink, Cleveland Heights, Ohio, assigned to The Gas Machiney Co., Cleveland. Patent 2,095,979.

Chromium Plating. John R. Mardick, New York, N. Y. Patent 2,095,995.

Method of Making Bearings. Henry Lowe Brownback, Norristown, Pa. Patent 2,096,157.

Method of and Apparatus for Working Material (Cutting Tools). Anton J. Brunner, Congress Park, Ill., assigned to Western Electric Co., Inc., New York. Patent 2,096,422.

Method and Apparatus for Grinding. Lawrence J. Cooney, Pittsburgh, Pa., assigned to Keystone Grinder & Mfg. Co., Pittsburgh. Patent 2,096,424.

Tools and Accessories

Metal Spray Gun. Rudolph Lensch, Los Angeles, and Paul Leder, Alhambra, Calif. Patent 2,096,119.

Rotary Cutting Tool. Edward Hassig, Milwaukee, Wis., assigned to Wetmore Reamer Co., Milwaukee. Patent 2,096,489.

October 19, 1937

Metal-Working Machinery

Machining Device (Drum). John Y. Blazek, Maple Heights, and James F. Strnad, Bedford, Ohio, assigned to Lempco Products, Inc., Bedford. Patent 2,095,225.

Forming Apparatus (Spinning). Thomas F. Brandt, Barberton, Ohio, assigned to The Ohio Brass Co., Mansfield, Ohio, Patent 2,095,310.

Bench Saw. Theron L. Hedgpeth, Oak Park, Ill., assigned to Duro Metal Products Co., Chicago. Patent 2,095,530.

Plate Bending Machine. William F. Huck, Richmond Hill, N. Y., assigned to R. Hoe & Co., Inc., New York. Patent 2,095,331.

Automatic Metal Working Machine (Bar Feed Chucking). Harry W. Rupple, Shaker Heights, Ohio, assigned to The Cleveland Automatic Machine Co., Cleveland. Patent 2,095,399.

Buffing or Polishing Machine. Carl O. Johnson, Springville, N. Y., assigned to Ralph B. Waite, Springville. Patent 2,095,501.

Finishing Machine. Gustave A. Carlson, Detroit. Patent 2,095,595.

Machine Tool of the Duplicator Type. George Gorton, Racine, Wis., assigned to George Gorton Machine Co., Racine. Patent 2,095,865.

Parts and Mechanisms

Device for Polishing and Abrading. John Coney, deceased, late of Kenosha, Wis., assigned to D. Harry Smith, Kenosha, and George W. Anderson. Patent 2,095,379.

Work Support Oscillating Mechanism. Donald R. Hall, Beloit, Wis., assigned to Gardiner Machine Co., Beloit. Patent 2,095,438.

Processes

Fusion Welding or Brazing of Metals. John R. Gier, Jr., Wilkinsburg, Pa., assigned to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Patent 2,095,807.

Method of Forming Laminated Strip Metal Stock for Bearings. Louis Sandler, New Castle, Pa., assigned to Johnson Bronze Co., New Castle, Pa. Patent 2,095,837.

Tools and Accessories

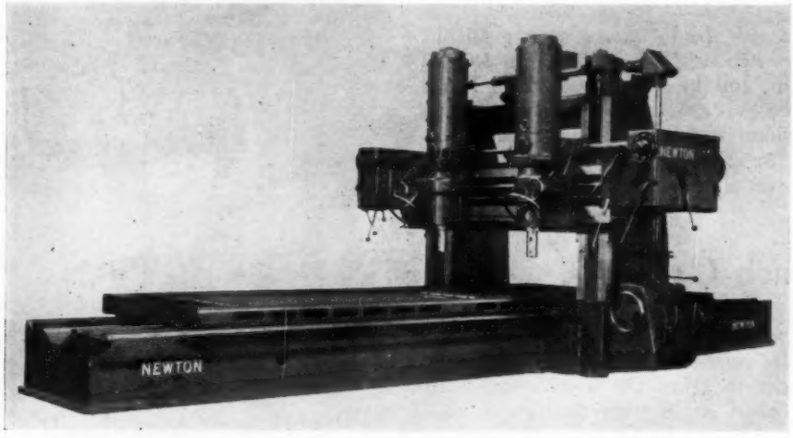
Direct Reading Micrometer. Walter A. Bohn, Lakewood, Ohio, assigned to Master Products Co., Cleveland. Patent 2,095,226.

Bore Measuring Attachment for Dial Indicators. Erik H. Aldeborgh and Christian E. Ruf, Poughkeepsie, N. Y., assigned to Standard Gage Co., Inc., Poughkeepsie. Patent 2,095,405.

Angle Scribing Apparatus. Leroy E. Ridgeway, Lomita, Calif. Patent 2,095,479.

Carburizing Box. Harvey H. Lightle, Detroit, assigned to The Electro-Alloys Company, Elyria, Ohio, Patent 2,095,565.

SHOP EQUIPMENT NEWS



Newton Two-Head, Planer-Type Drilling and Boring Machine

Arranged for precision drilling and boring of large frames and castings where numerous holes must be accurately positioned, a planer-type drilling and boring machine is offered in a wide size range by Consolidated Machine Tool Corp., Rochester, N. Y. Both of the heads and the table are provided with handwheels for precision positioning. They also are fitted with end measures, inside micrometers and dial indicators. Boring bars have vertical power rapid traverse and heads have rapid traverse across the rail. Both the rail and the table are provided with power feed and traverse.

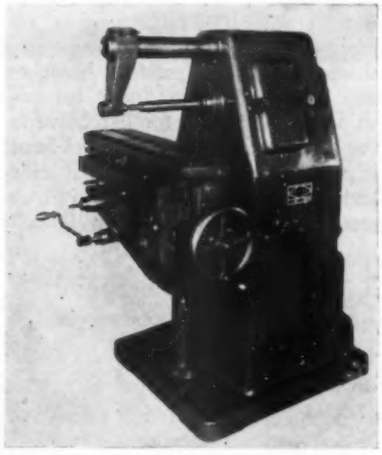
Large dials on each head indicate directly in r.p.m. and dials on each gearbox show the feed per revolution. Boring bars carried in the two saddles are double splined to fit the driving gears which have extended hubs mounted in precision Timken bearings. The upper end of each bar has an additional bearing ring in a slide with roller thrust collars to take the thrust of the cut. The right-hand head is operated from the gearbox at the right-hand side of the rail and control of the left-hand head is from the left end.

Table can be built in one piece or can be arranged in two sections as shown. These two sections can be coupled together or used separately so that one can be loaded while the other is in use. Tables are mounted on one V and one flat way, and continuous feed for the combined length is provided through the angular rack under each table. Tables are also equipped with milling feeds through worm and rack drive to provide for milling the sides of castings in case a side milling head unit is mounted.

Producto-Matic No. 14 Knee-Type Plain Miller

Arranged with power feed to the table, the No. 14 Producto-Matic knee-type milling machine, announced by the Production Machine Co., Bridgeport, Conn., has a one-piece column which incloses the motor and acts as a support for the knee, saddle, gearbox and table. V-pulleys and belts are used to secure twelve changes of spindle speeds and six changes of table feeds. Cutter spindle rotates in two Timken roller bearings and has a No. 40 National Standard taper in the end. Table feed mechanism consists of a telescopic universal drive-shaft from the transmission into the gearbox, which is mounted under the saddle. Feed to the table is through a steel screw and bronze nut.

Specifications: Working surface of table, 26x6 in.; longitudinal power feed of table, 14 in.; cross feed of table, 7 in.; vertical feed of table, 12 in.; distance from spindle to center of table, 4 in. minimum and 11 in. maximum; range of spindle speeds, 72 to 1,300 r.p.m. in twelve steps; range of table feeds, 1¾ to 11 in. per min. in six steps; distance from underside of overhanging arm to center of spindle, 6½ in. Base of the machine measures 32x28 in. and the height from the floor to the top of the column is 23 in. A 2-hp., 1,200-r.p.m. motor is recommended. Net weight is approximately 1,550 lb.



Atlas No. 7 Bench-Shaper

Ram driving mechanism of the No. 7 bench shaper, offered by Atlas Press Co., Kalamazoo, Mich., is of the bull-gear type and a V-belt drive from the motor to the bull-gear spindle provides four speeds ranging from 45 to 200 strokes per min.

Shaper is designed for operation from a ½ hp., 1740 r.p.m. motor. A floor stand is available.

Specifications: Stroke, with quick return, ½ to 7⅜ in.; cutting speeds, 3½ to 116 ft. per min.; horizontal table travel, 8½ in.; vertical table travel, 4½ in.; maximum distance from table to ram, 5⅛ in.; minimum distance of table to ram, ⅝ in. The table is 8¾ in. long, 6 in. wide and 6 in. deep. It has three T-slots, each ⅜ in. wide. The vise swivels 90 deg. right and left, and opens 4 in. jaw width is 4⅛ in. Tool head is graduated from 0 to 50 deg. right and left and has a 3-in. feed. A swivel clapper is provided. Reversible cross feed is 0.005 in. per stroke for each tooth on the ratchet. Five

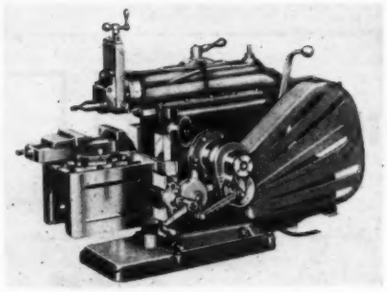


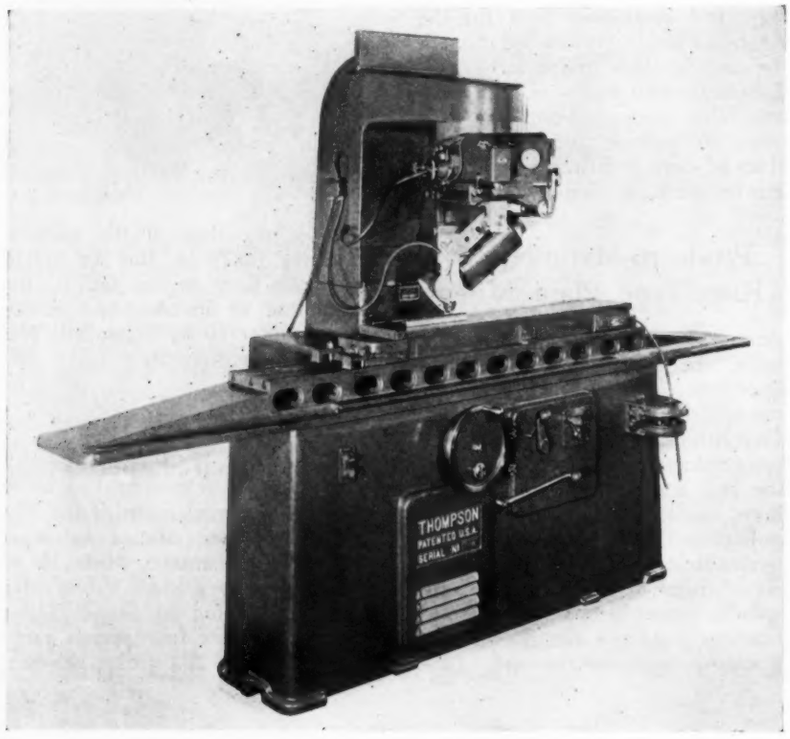
table feed rates are available.

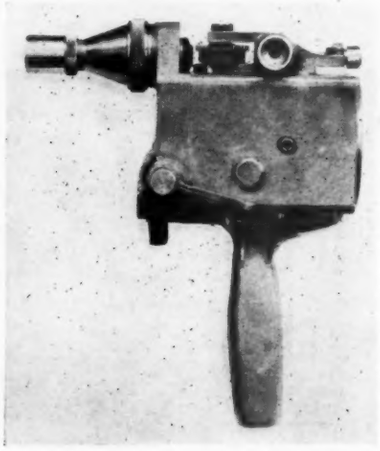
Bench space occupied is 18x32½ in. and height over-all from bench base is 25 in. When used with a floor stand, this unit requires an 18x32½ in. space and has a total over-all height of 59 in.

Thompson Broach Grinders

Available in 6x48, 6x60 and 6x72-in. sizes, the surface-broach grinders announced by The Thompson Grinder Co., Main & Murray Sts., Springfield, Ohio, have wheel heads that swivel 45 deg. each way and wheel-head motors that swivel from 0 to 90 deg. These machines are designed for manufacturing and sharpening flat or surface broaches and have a locating finger for positioning the broach tooth relative to the grinding wheel. The wheel head is provided with a longitudinal slide and swivel to accommodate various tooth and rake angles. Entire wheel-head unit may be adjusted in angular relation with the broach in order to grind the teeth at an established angle with the broach axis.

The manually operated machine, Type T-47, locates broach teeth either to a pre-determined spacing or from established teeth. Oil-pump drive motor recommended for this machine is 1-hp., 1,200 r.p.m. Net weight is approximately 5,400 lb. The semi-automatic machine, Type T-20, has a hydraulically operated table feed and is arranged for automatic tooth location. Table operation is in timed relation with the wheel-head stroke and can be operated at a variable speed. The wheel head is designed for 6-in. grinding wheels and operates at 3,600 r.p.m. It is driven by a ¼-hp. motor. This machine requires a 2-hp., 1,200 r.p.m. oil-pump drive motor and has a net weight of 6,400 lb.





"Majestic" MetaLayeR Metal Spray Gun

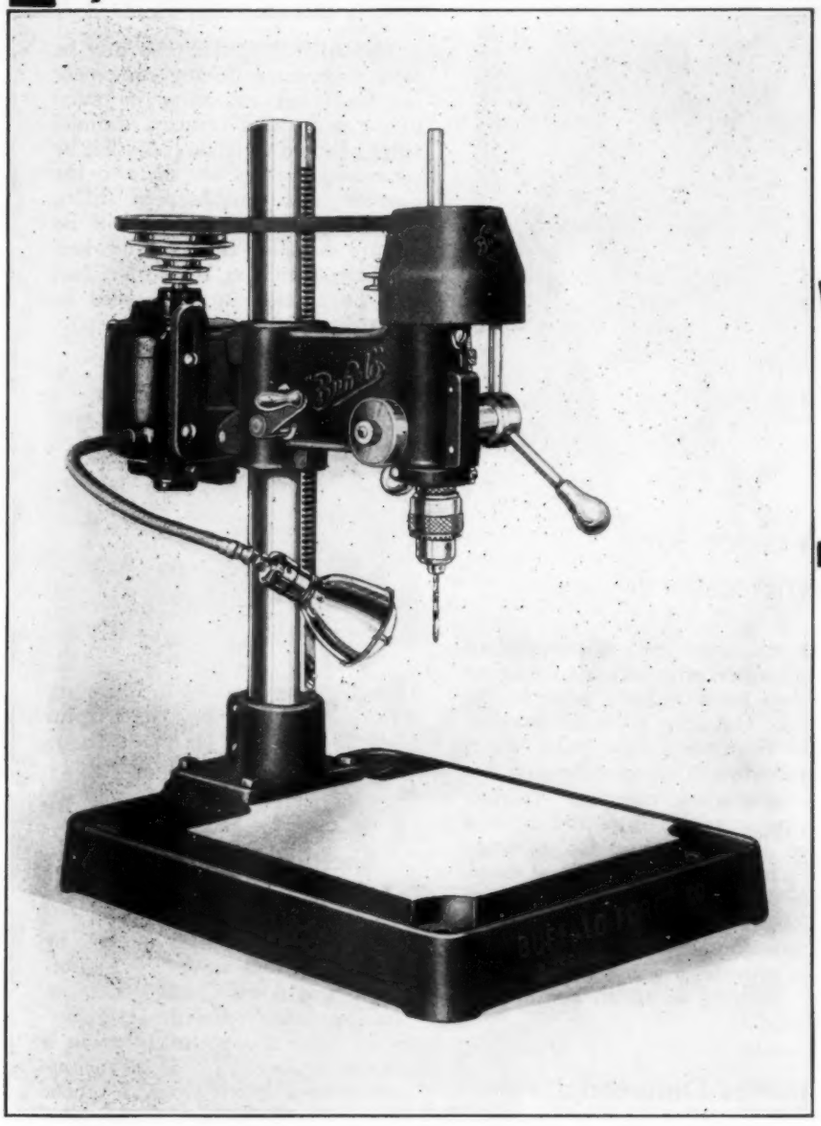
Available with a standard handle for manual operation, or with an adjustable toolpost holder for mechanical operation, the "Majestic" MetaLayeR gun announced by Metals Coating Company of America, 495 North Third St., Philadelphia, Pa., will handle wires ranging from No. 20 B&S gage to ⅛-in. diameter, depending on the requirements of the work. The train of gearing from the turbine to the final feed roll consists of two hardened worms, one bronze and one fiber gear. Entire assembly is inclosed in a compartment containing grease to insure lubrication. Feed rolls are engaged by an adjustable latch bolt which is operated with a single motion. Gun can be lit and flames adjusted with or without feeding the wire, eliminating the necessity for wasting wire during adjustment.

Moore Rotary Table

An error in the description of the rotary table, designed for use with the Moore jig borer, announced by Marburg Bros., Inc., 90 West St., New York, N. Y., (*AM*—Vol. 81, page 891), has been called to our attention by R. F. Moore, Moore Special Tool Co., Inc., Bridgeport, Conn.

The micro adjustment available with this table permits accurate spacing of holes within 0.0002 in. on a 10-in. diameter, instead of within 0.002 in. as previously stated.

ANNOUNCING *the new* "Buffalo" No. 15 MANUFACTURING DRILL



★ ★ ★

● In announcing this new drill, "Buffalo" leads again in making a drill to fit modern manufacturing needs. It offers all the advantages of the rugged low cost No. 15 drill plus new features to give quicker change of set-up, correct take-up for wear, and adequate room for handling jigs and work pieces. Easier to operate. Least non-production time.

Drill is full ball bearing type. Has 5 speeds. Pulleys designed to carry the full capacity of standard "A" section V Belts. Table base is 18"x22" with 14"x14" true plane working surface.

No detail has been overlooked to make the new "Buffalo" No. 15 Manufacturing Drill the finest in its class on the market.

Write today for full details and prices.

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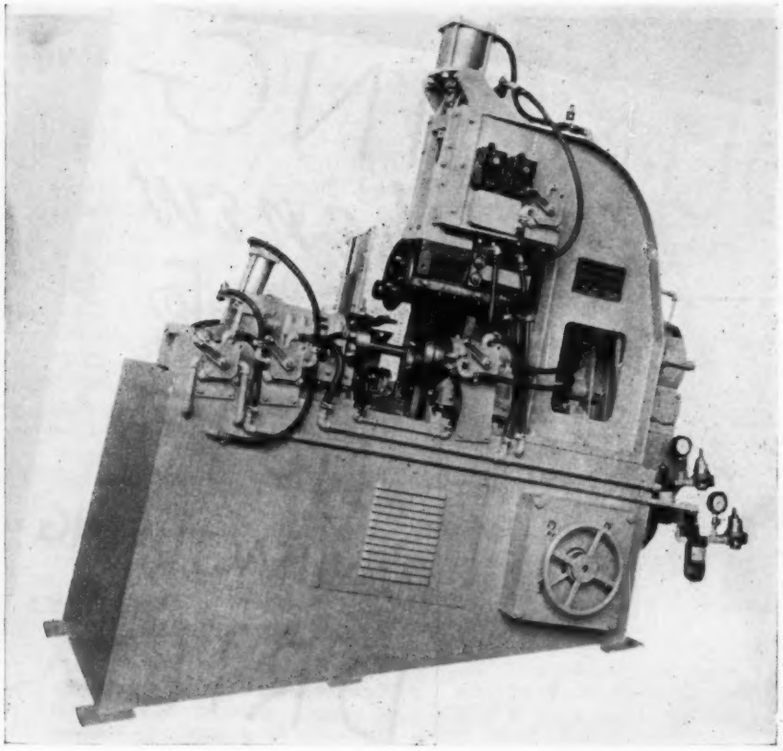


Federal Seam Welder for Refrigerator Compressors

Designed to weld the flanged edges of two halves of refrigerator compressor housings and to make a pressure-tight seam weld that will prevent escape of gases and liquids, this electric welder recently constructed by The Federal Machine & Welder Co., 212 Dana St., Warren, Ohio, is rated at 440 volts, 60 cycles, 250 kva. The secondary circuit is water cooled, and primary windings are tapped with a four-point regulator switch on each side of the housing, giving a total of sixteen points of voltage and current regulation.

This welder is designed to sit at an angle so that any oil in the housing will drain away from the joint being welded. The two halves of the housing are clamped together by pneumatic cylinders and they are held in alignment by rabbetted rolls. Current is brought to both sides, to obtain uniform distribution. The other side of the transformer is connected to the upper welding roll, which is knurl driven. When the operating button is pushed, the pneumatic cylinders press the upper electrode against the edges of the flange and the work and electrode rotate, making an interrupted seam weld. Weld is controlled by vacuum-tube timers which can be adjusted over a wide range.

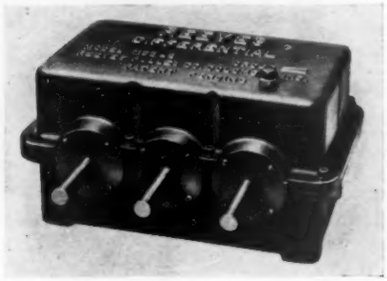
A magazine feed is provided to insert a steel strip between the upper electric roller and the edge of the flange. This strip is welded onto the seam to insure a tight joint. Welding pressure is obtained by means of a double-acting pneumatic cylinder having an air regulator and pressure gage in the air line for adjusting pressure to suit the work at hand. The welder is motor-driven through a Reeves "Vari-Speed" drive, giving a three to one speed regulation. Design provides a welding speed ranging from 3½ to 10 ft. per min. as desired.

Reeves Differential-Type Variable-Speed Control

Listed as Model MDB-3, this differential control for variable-speed transmission service is offered by Reeves Pulley Co., Columbus, Ind. Designed for use in automatic speed control, such as synchronization of two or more machines or parts of a single machine, it also can be used for maintaining uniform peripheral winding or unwinding speed.

In this unit three parallel shafts are mounted in a unit housing. For automatic control service, the two outside shafts are connected to the driven machine or machines and the center shaft is connected to the speed changing screw of the Reeves transmission. When the outer shafts are driven in the same direction at the same speed, the center shaft stands still. When, however, the speed of the driven machine varies above or below the desired speed, this variation is transmitted to the center shaft which speeds up or slows down the transmission until synchronous speed is restored.

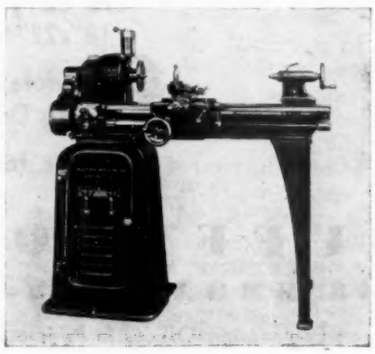
The differential unit also may be used as primary driving equipment for loads not exceeding its rated torque and speed capacity. Infinite range of speed variation is possible by connecting the outside shaft to the contsant- and variable-speed shafts, respectively, of the transmission. By turning the speed control handwheel on the transmission, the center shaft may be adjusted to any speed in either direction, including zero r.p.m.



Over-all dimensions of the unit are 8-in. wide, 11-in. long, and 6⅝-in. high. Shafts extend on both sides of the housing so that installation may be made to suit local conditons.

Sheldon Under-Motor Lathe-Drive Attachment

Sheldon 10-in. lathes, offered by Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill., can now be furnished with an under-motor drive attachment either in a cabinet leg, as shown, or for mounting under a bench when a bench-type lathe is required. This unit



TIME AND WORK SAVING

All vertical adjustments are obtained by moving the spindle head. This feature eliminates the necessity of raising and lowering a large, heavy table unit and helps eliminate wear on the face of the column.

•

MAKE A BETTER PROFIT AND STILL MEET TODAY'S DEMAND

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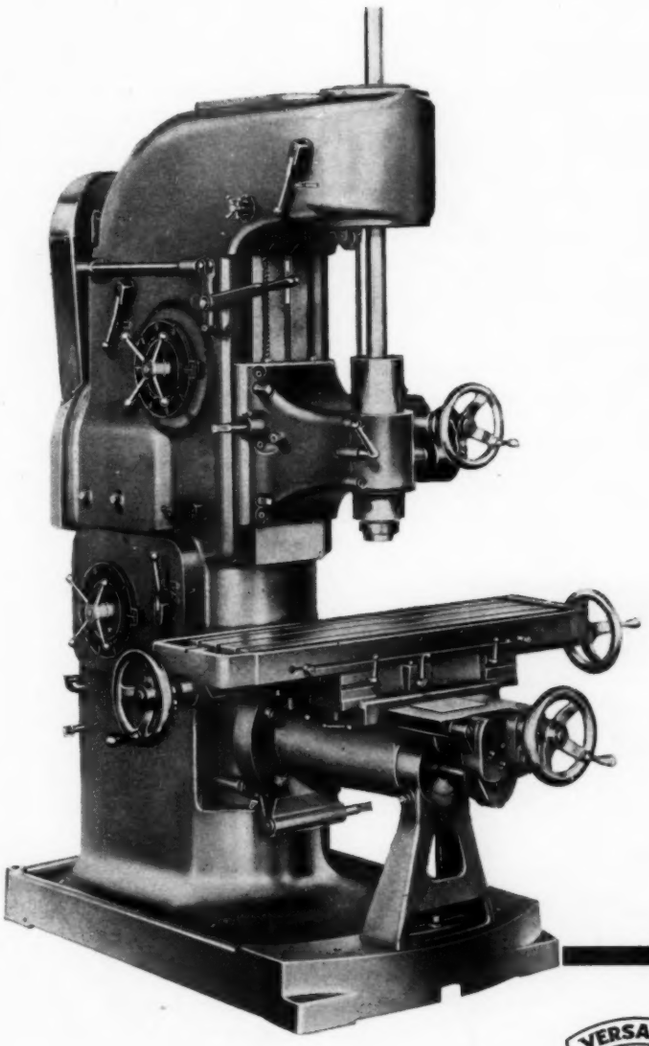
AND
More Accurate Work

Do it with the . . .

New No. 40 KNIGHT MILLER



● The men who pay the bills and the boys who do the work agree on the greater earning power of the Knight Miller No. 40. They all say the answer is in the Knight "BALANCE" which means that all features—accuracy, rigidity, power, and flexibility are equally developed to the highest degree. This means utmost efficiency and savings on the widest possible range of work, and with a minimum amount of investment in special equipment and tools.

Many of the men who pay the bills were quick to purchase another Knight Miller once they found that so many jobs could be done with the one first installed.

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W. B. KNIGHT MACHINERY CO.

ST. LOUIS MO.

provides four speeds by means of two positive clutches on the drive shaft. These clutches are operated by the two levers shown in front of the cabinet leg. There are eight spindle speeds, four direct and four through backgears. There are no belts to shift and no doors or guards to open in changing speeds.

Sheldon 10-in. lathes swing $10\frac{1}{4}$-in. over the ways and are furnished in two bed lengths, giving 20 and 26 in. maximum center distances. The spindle runs in bronze bearings and has a $1\frac{7}{16}$-in. diameter hole. Round collets up to $\frac{3}{4}$-in. capacity can be used. All 10-in. lathes are furnished with semi-quick change-gear boxes with necessary gears for cutting threads from 4 to 80 per in. Plain, worm-feed and power cross-feed aprons can be furnished.

Ex-Cell-O Two- and Three-Way Multiple-Spindle Boring Machines

Designed for multiple boring, facing and turning operations in high-production operations, the line of two- and three-way boring machines announced by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich., can be arranged with from two to nine spindles. These machines eliminate errors in machining arising from locating parts in separate fixtures on different machines for individual boring, turning or facing operations. Multiple fixtures, when used with multiple spindles, provide for higher productivity per machine-hour for parts requiring operations on one side only.

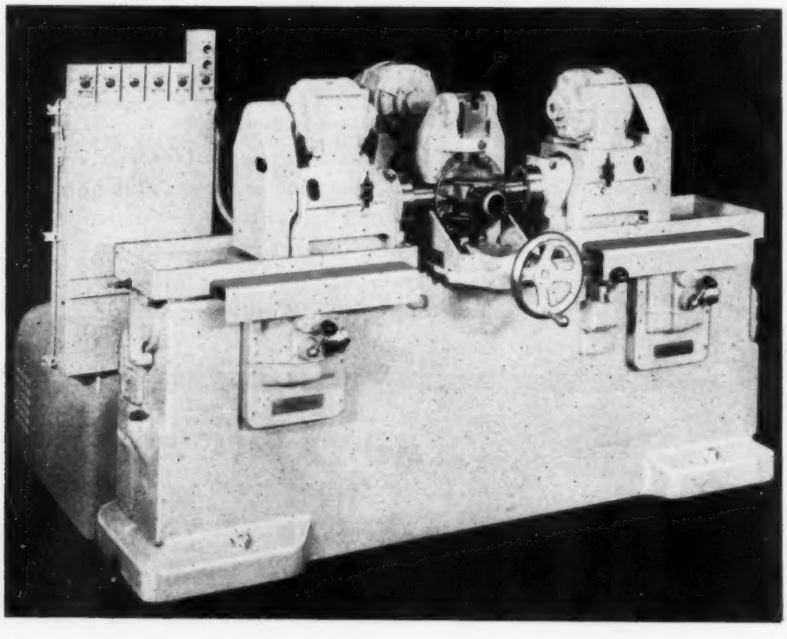
Boring spindles, with their individual motor drives, are separately mounted on sliding tables, as indicated in the accompanying illustration showing a three-way unit. Table feed is hydraulic with individual pump for each table. Spindles are of the precision ball-bearing type mounted in heads that are designed for the addition of extra spindles. Cutting cycles are completely automatic and each table is provided with micrometer-adjustment dogs for setting the distance for fast approach, dwell, and fast return. The dwell period at the end of the cutting stroke is separately adjustable for one to 30-sec. to insure desired finish characteristics. A rapid advance between two holes bored by one spindle may be provided for in the cycle.

Spindle speeds are constant for any particular job and are designed to give a cutting speed of approximately 400 ft. per min. with carbide cutting tools. Feeds may be varied from zero to 42 in. per min. to meet varying requirements for different materials, types of work and character of finish required. Lower spindle speeds can be provided for using high-speed cutting steels. Individual starting controls of the push button type are provided on the control panel. These control the electric motors operating the spindles and pumps while two additional buttons permit simultaneous starting and stopping of all motors.

Each table is provided with a separate level control to permit individual operation, or all three tables may be started and stopped with a single lever. Individual controls are valuable in setting-up or retooling any individual carrier. Controls are adjustable in order that carriers may be fed-in simultaneously, or in rotation. A sump is provided in the base of the machine to permit the installation of a coolant system. Where such a system is used the coolant pump is driven from one of the hydraulic control pump units.

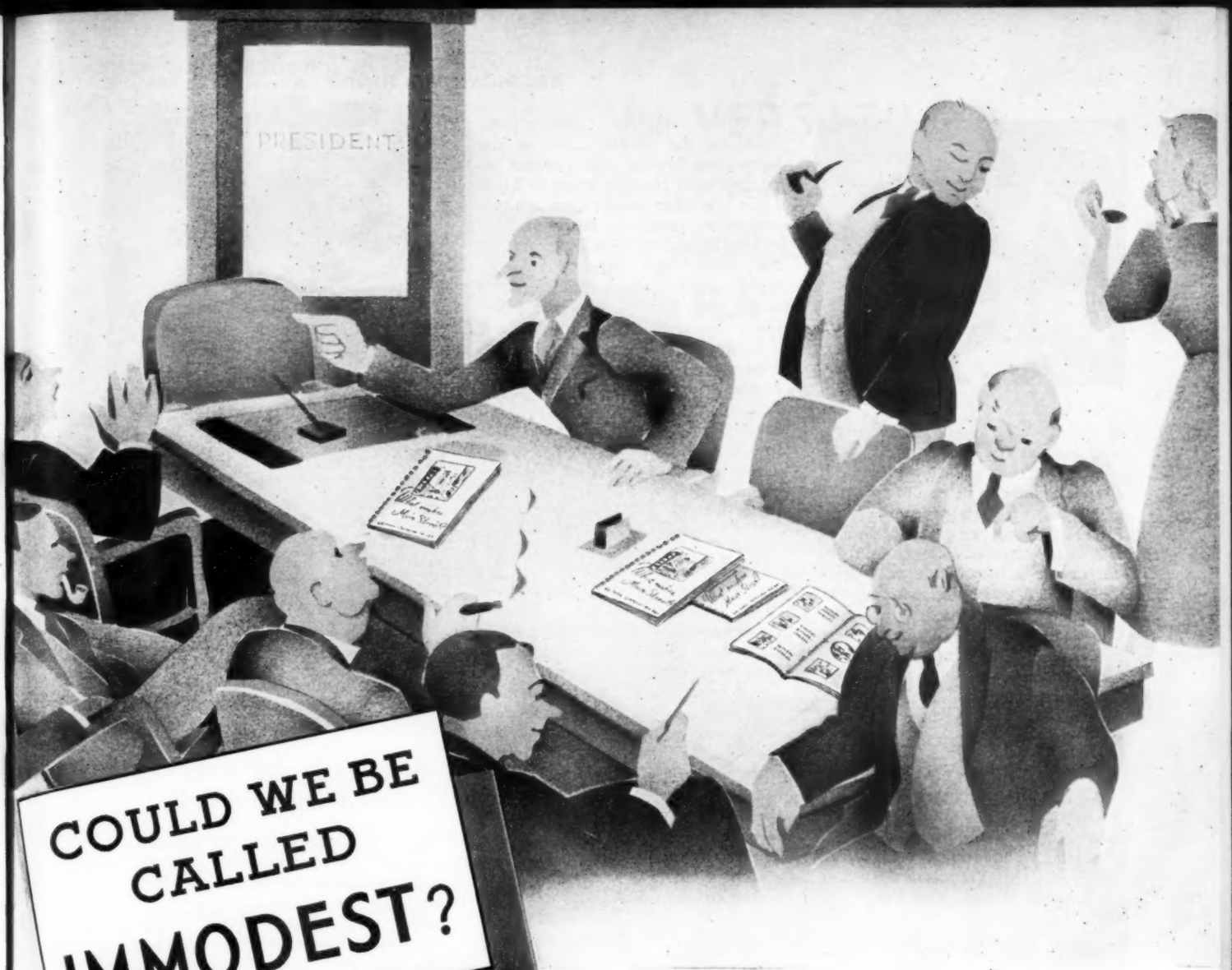
Chips drop down through the top of the machine and are ejected out of the back through slides. Parts are clamped in stationary fixtures, those shown being of the manual type. Both hydraulic and air-operated fixtures may be used, and these can be synchronized with the cutting cycle. Spindles are universally adjustable, vertically, axially and transversely. Holes ranging from $\frac{3}{8}$ to 6 in. in diameter may be bored. Maximum table travel is 12 in. The fixture pad, measuring 15x15 in., provides ample support for large fixtures. Return speed and rapid approach is 11 ft. per min.

The two-way type unit is similar in design to the three-way model and it is adaptable to a wide variety of multiple operations. This machine may be used advantageously for two-way machining on a single port, or for simultaneous or alternate machining of separate parts. For continuous production, this two-way type can be equipped with a vertical or horizontal multi-station rotary indexing fixture which permits the performance of a multiplicity of boring, turning and facing operations.



Vascoloy-Ramet Grade E Steel-Cutting Material

Grades E and EE Vascoloy-Ramet steel-cutting hard alloys, announced by Vanadium-Alloys Steel Co., Latrobe, Pa., are composed of tantalum carbide and some special ingredients which are claimed to prevent "galling" or "pick-up" when machining steels. The Grade E alloy has a strength in transverse rupture tests of 217,000 lb. per sq.in. and a hardness of 92.0 on the Rockwell A scale. It is recommended for machining such steels as S.A.E. 1045, manganese steels, nickel-chrome steels and high-alloy cast irons such as copper-silicon and nickel alloys. Grade EE is softer and tougher than Grade E and is recommended for intermittent cuts on alloy cast irons, such



COULD WE BE CALLED IMMODEST?

IF the above scene suggests that "What Makes Main Street" is responsible for this conference, please forgive us. The idea we wish to convey is that this new book by LeBlond contains plenty of meat for a meeting of minds on the important subject of lathes. • Between its covers, executives close to production problems will find a comparative panorama of facts. It is designed to sweep away the cobwebs of confusion and point the mind to salient reasons why LeBlond Lathes are the key to a faster, simpler costdowning production. • The tempo of Main Street is the tempo of the lathes that serve its progress. "What Makes Main Street" reveals for the first time the real meaning of this world artery of production . . . where LeBlond Lathes have played a vital part for fifty years.

No conference required to get a copy. Simply send a quarter of a dollar via the coupon—it will come back with interest if we've overestimated its interest to you ! ! !

What makes Main Street?

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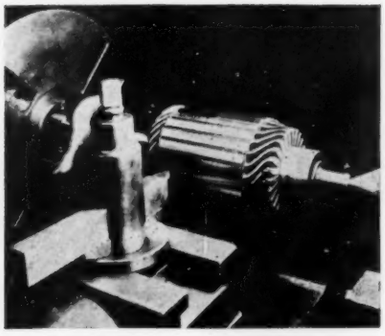


as copper-silicon and nickel cast irons, steel castings and forgings.

Speed of cutting with the Grade E alloy is claimed to be two to six times as fast as with high-speed steel tools. Pieces obtained per grind of tool is said to be increased as much as 10 to 50 times that obtainable with steel tools. Unless otherwise specified, finished tools are supplied with 6 deg. side rake, zero back rake and 5 deg. clearance on front and side. These materials are available in completely finished and ground tools, "milled and brazed only" tools and blanks.

Hardinge Bench Lathe With Transitorq Drive

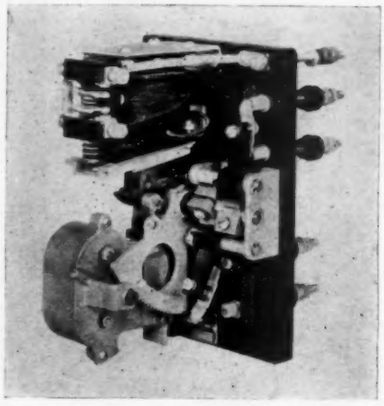
Hardinge Bros., Inc., Elmira, N. Y., offer its ball-bearing bench lathe equipped with a Transitorq drive and a two-speed motor. The Transitorq has a range of 1 to 10 below low and high speeds and the two-speed reversible motor has a 1 to 2 ratio, giving the machine spindle a double speed range of 1 to 20, or 150 r.p.m. and all intermediate speeds to 3,000 r.p.m. With the Transitorq handwheel set for 1,000 r.p.m., changing the control lever at the lathe from low to high position instantaneously changes speed to 2,000 r.p.m., in otner words, there are two immediate speeds in every position of the Transitorq. The long lever at the lathe head gives "low-stop-high" speed changes and the short lever gives "reverse-brake stop-forward" speed changes.

Design places the Transitorq and motor under the bench and back out of the way of the operator's knees. The mounting is rubber-insulated against vibration. Provision is made for quick adjustment of drive belts. These lathes are offered in five sizes, ranging from $\frac{1}{2}$ to 1-in. collet capacity with 7 or 9-in. swing.

G.E. Clutch Type Definite-Time Relay

A definite-time relay employing a clutch-type time-delay interlock has been developed by General Electric Co., Schenectady, N. Y., to provide a reliable means of timing a sequence of operations in a control system. Available in either a.c. or d.c. forms, with two, four, or six circuits, the No. CR 2820-1729 relay is adapted for use wherever it is desired to perform several operations in sequence. The relay consists of a solenoid and a plunger which is mechanically connected to the time-delay mechanism and to a shaft which operates the contact fingers. On the d.c. forms, a separate, small instantaneous cutout switch is mounted on the front of the solenoid.

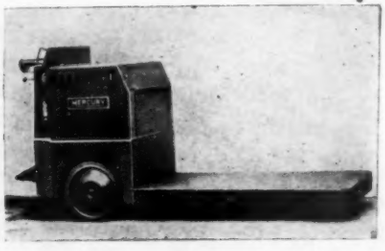
Positive and uniform operation is claimed to be assured by coil springs



which give a constant pull on the timing mechanism throughout the entire operating cycle. Since a "free-wheeling" clutch principle is used on the time-delay mechanism, the relay is always in gear and accuracy is held at the maximum. Typical applications include the operation of accelerating contactors, starting several motors at intervals to avoid excessive line current and starting different parts of machines or processes where delay starting of some part is desirable.

Mercury Model A-1015-1 Low-Platform Truck

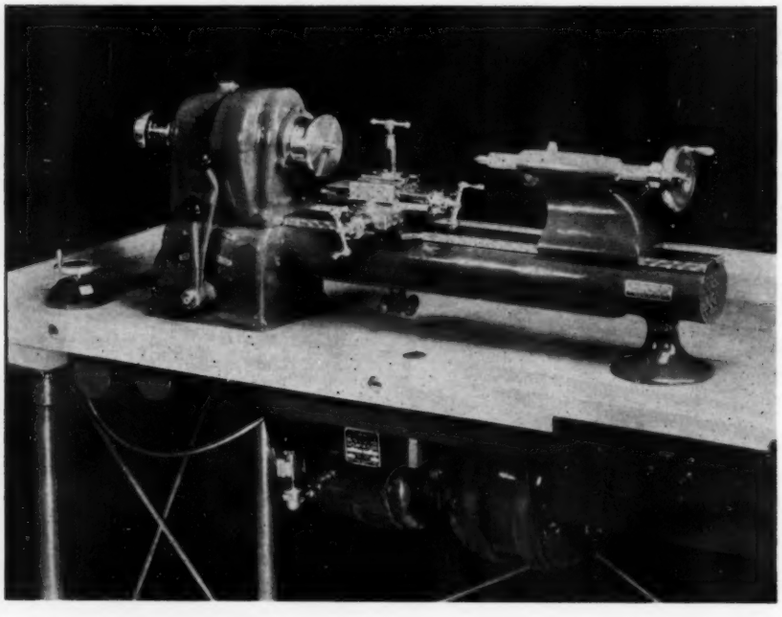
Three speeds in either direction are provided by a snap-action mechanical contactor on the Model A-1015-1 low-platform burden carying truck offered by The Mercury Mfg. Co., 4118 S. Halsted St., Chicago, Ill. This truck is of the four-wheel steer type, and steering control is of the horizontal lever or tiller-bar type. Vertical lever or wheel-type



steering mechanism can be furnished.

This truck has a capacity of 4,000 lb. and a 41 in. wide by 72 in. long by 11 in. high load platform. A truck of 6,000 lb. load capacity is also offered.

Frame assembly is by electric arc welding. Drive axle is of the double-reduction spiral-bevel and spur gear type, with external contracting brakes. Drive wheels are size 20x5 in., solid rubber tired, and trailing wheels beneath the load platform are 10½x5 in. solid rubber tired.



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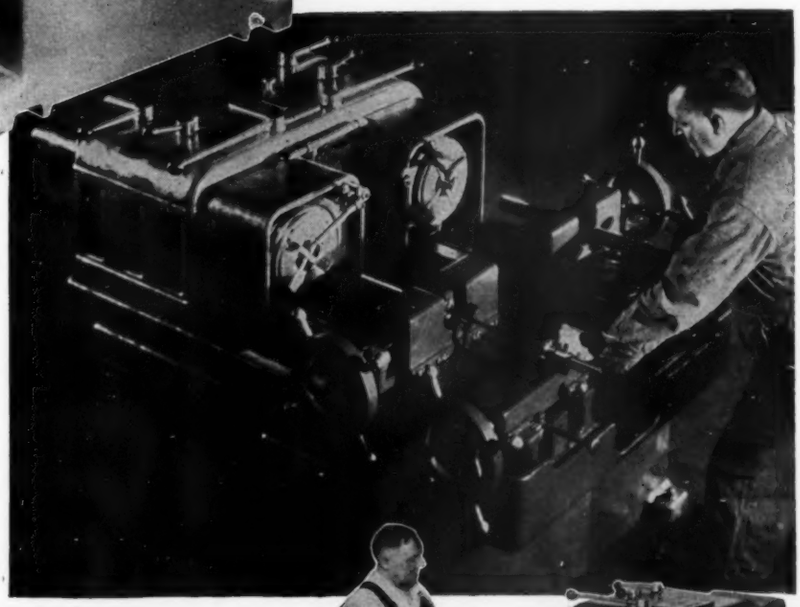
OSTER THREADING EQUIPMENT WILLIAMS

Capacity, ½" to 2¼" or ⅜" to 1½", in both single spindle and double spindle types. Spindle speeds, 32 to 298 R. P. M. Double spindle machine (center illustration) can be set to cut right and left hand threads simultaneously.



Fast, accurate and easy to set up for standard or special jobs, the Rapiduction will handle bolts, anchor bolts, tie rods, jackscrews, vise screws, steering rod knuckles, heavy cap screws, hooks and eyes, staybolts, pipe, nipples or what have you.

Newest machine in its class, the OSTER Rapiduction Bolt Threader has already forced its way to the front. If you have a production threading job to be done, be sure to get the detailed story of this *completely modern* all-round high production threader. Write

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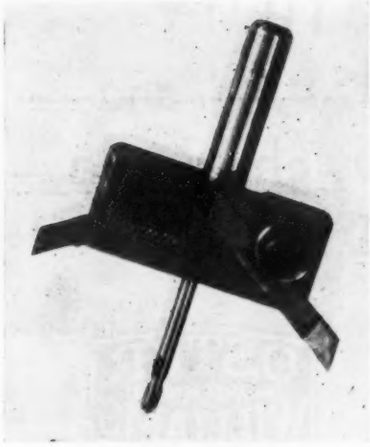
OSTER RAPIDUCTION BOLT THREADER



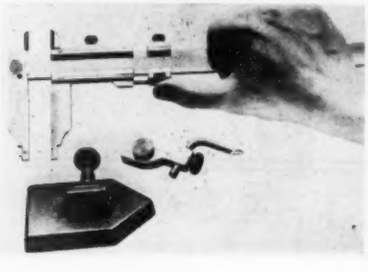
D & D Hole Cutter

Made in three sizes to cover a full range of holes from ¾ to 6 in. diameter, the "hole cutter" offered by D & D Tool Co., 2518 Western Ave., Seattle, Wash., has bits which can be adjusted independently and are easily replaced. The "Standard" cutter drills holes ¾ to 3 in. diameter, including all sizes within that range, with any electric drill or hand-brace.

Recommended for heavier work and where the tool is used by more than one operator, the "Heavy-Duty" cutter drills holes ranging from 1 to 3½ in. diameter and can be used with any electric drill. The "Special" cutter, shown in the illustration, drills holes ranging from 3½ to 6 in. diameter, and is designed for shop use with a stationary drill. Pilot drills are replaceable. These tools have been used for cutting all types of metals and have proved satisfactory for cutting Bakelite, hard rubber, fiber and wood.

Mauser No. 537 Vernier Caliper

Available with measuring capacities of 7, 9 and 11 in., the Mauser No. 537 vernier caliper, offered by George Scherr Co., 128 Lafayette St., New York, N. Y., is graduated in 0.001 in. and in 1/128 in. A base is furnished for mounting the caliper vertically by means of a screw and an accurately tapered center at one end of the jaw. Base is of heavy design with large area so that the gage will rest on the surface plate without danger of tilting. Two knife edges are furnished for layout work and for measuring distances between holes. A scribing attachment, which may be attached to the upper jaw, is furnished as a separate unit. Steel point of this scribing attachment is adjustable, making it possible to set the height gage at an even figure of the scale when starting to measure.



"Logan" Sure-Flow Centrifugal Pump

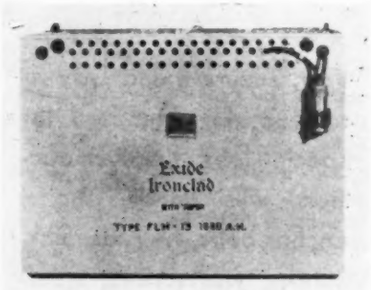
Made in ten sizes, with capacities ranging from 4 to 150 gal. per min., the "Logan" Sure-Flow pump, manufactured by Logansport Machine Co., 906 N. Market St., Logansport, Ind., is available with direct motor drive, stub-shaft adapter for vertical power take-off and with belt drive. These pumps are claimed to be inherently self-priming and no part of the pump need be submerged. Impeller is semi-scavenging in action and the pump will handle liquids charged with abrasives, chips, filings and many corrosive impurities. Drive shaft and bearings are protected from the liquid by rotary seals. Entrained air or vapor will not interfere with the operation of the pump and it will handle liquids under temperatures up to the boiling point.

Three styles of mounting are available. These are: standard horizontal base as shown, vertical mounting bracket type and flange-type base for close mounting on a vertical plane. It is said that these pumps are readily adapted to a wide variety of services, such as coolant service on machine tools, circulating cooling mediums, circulating quenching oil, sump pump service and for pumping out underground tanks. The units are compact and self-contained and no special provisions are necessary for mounting.

Exide Type FLM-13 "Ironclad" Battery

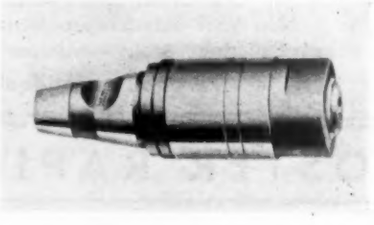
Designed especially for heavy-duty, electric industrial truck service, the super-type FLM-13 Exide-Ironclad storage battery, offered by the Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia, Pa., has a capacity of 1,080-amp.hr. at the normal six-hour discharge rate. It is a 16-cell battery assembled in a steel tray which occupies a 26x51-in. space. The unit is 37½ in. high and weighs approximately 2½ tons.

When used in double-shift service, the steel tray assembly permits quick exchanges and continuous service through the use of duplicate batteries. The steel tray can be rolled or litted from the truck when one battery is discharged and a freshly charged battery can be installed in its place.

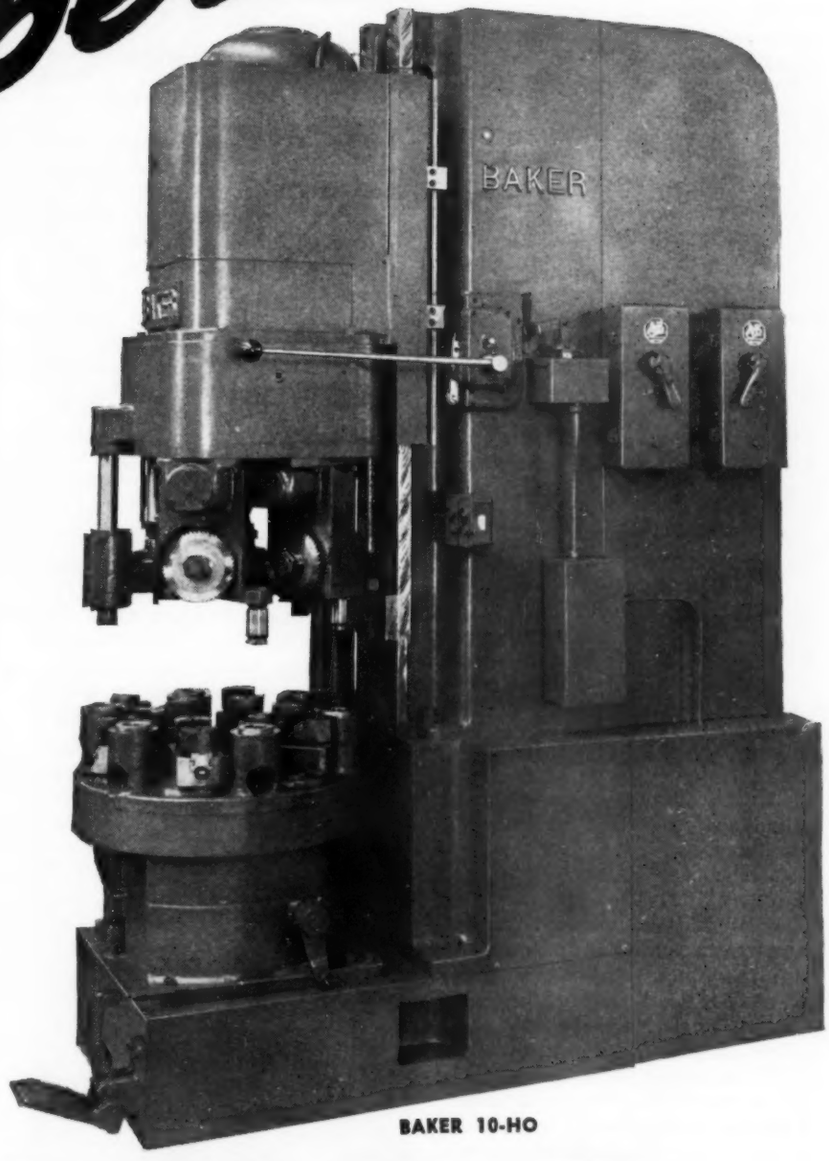


B&S Cam-Lock Arbor

Designed for use with cutter adapters and milling attachment spindles equipped with a cam-type, lock, the cam-lock arbor announced by Brown & Sharpe Mfg. Co., Providence, R.I., makes it possible to use certain small milling and other cutters with cam-lock adapters. These arbors are arranged for use in a No. 30 milling machine standard taper hole and are available with ⅞ and 1 in. diameters. Length of each size, from shoulder to nut, is 2 in.



Combine Operations



BAKER 10-HO

★ Baker machines are flexible and can be adapted to fit the job. This is the plus service that production executives expect from the new equipment.

The machine illustrated *mills two slots* in addition to drilling, reaming and facing operations. We do not manufacture milling machines but by adding two milling stations to this machine, we have provided the manufacturer with one machine which does the work of two—obviously saving manufacturing expense.

The flexibility of regular Baker machines for drilling, boring, reaming and tapping makes it possible for us to develop unusual applications. You may have a production problem that we can solve. Submit a blueprint or sample part for a prompt recommendation from our engineering department.

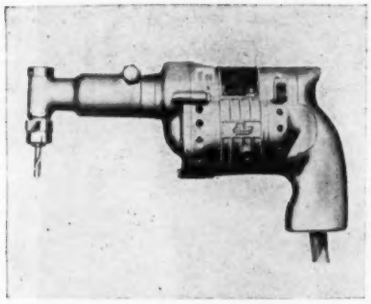
BAKER BROTHERS, INC.
Toledo, O., U.S.A.
Newark, N. J. office, 1060 Broad St.

★ BAKER ★

Fansteel "Tantaloy" Hard Cutting Alloy

Fansteel Metallurgical Corp., North Chicago, Ill., has announced the development of "Tantaloy" material for hard-cutting tool and wear-resisting purposes. It is claimed to be especially suitable for use as a tip to be brazed to a steel shank to form a cutting tool. Containing tantalum carbide, this material possesses a high degree of chip slippage which resists the development of craters by chip action. Toughness of the material is claimed to make it efficient for interrupted cuts, heavy feeds, varying hardness of metal, and for applications where tool mounting is deficient in rigidity.

Tantaloy tipped tools are available in all standard lathe, boring mill and turret lathe tool sizes. The metal is also available in tips which may be brazed to boring bars, counter bores or special tools. It can be used for gages, lathe centers, centerless grinder rests and other wearing surfaces requiring abrasion and corrosion resistance.



I.P.T. 3/16-In. Right-Angle Portable Electric Drill

Drill head on the right-angle type, $\frac{3}{16}$-in. capacity portable electric drill announced by the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill. measures $2\frac{1}{8}$ in. overall and the angle attachment can be turned and clamped in any position. Possible working clearance is $2\frac{3}{8}$ in. and net weight is 3 lb. Over-all length is $9\frac{1}{4}$ in.

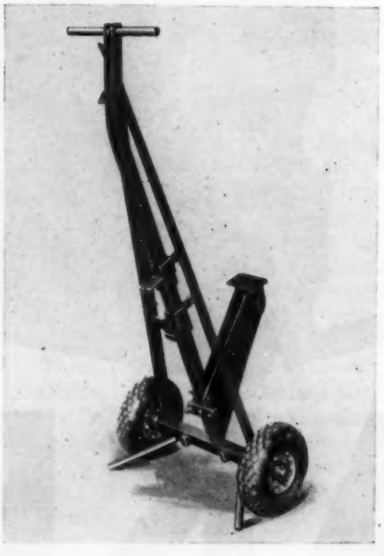
Spindle offset is $\frac{13}{32}$ in. and the drill is equipped with $\frac{1}{16}$, $\frac{3}{32}$, $\frac{1}{8}$, $\frac{5}{32}$ and $\frac{3}{16}$ in. collets for twist drills. It also can be supplied with a spindle to take a $\frac{3}{16}$ in. chuck. Construction features include alloy-steel helical gears and radial-vent cooling. Three models are available: Type U13R operates at 3,750 r.p.m., Type U14R runs at 2,700 r.p.m. and Type U15R runs at 5,100 r.p.m.

G. & K. Applicator for Belt Dressing

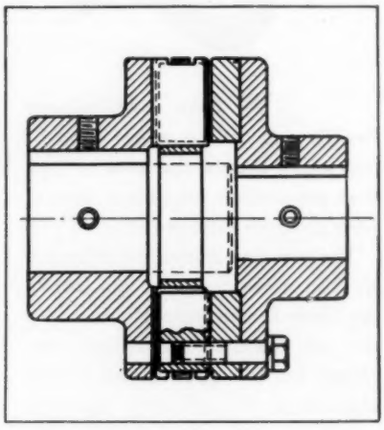
A trigger-action belt dressing applicator, offered by Graton & Knight, Worcester, Mass., is arranged so that two or three trigger squeezes will apply enough dressing for the average belt. This applicator can be used at some distance from moving units, increasing the safety of the dressing operation. Application is said to be made evenly and in small quantities, avoiding wasteful "overdressing."

Sabin Type A3 Hand Truck

The Sabin Machine Co., 6538 Carnegie Ave., Cleveland, Ohio, offers the Type A3 truck for handling barrels and drums ranging from keg size to 36 in. high. This truck has an attaching device consisting of a hook and a tongue member that is adjustably mounted on the vertical column. In operation the tongue member is positioned about 1 in. above the lower edge of the barrel chime while the truck is held against the barrel at both top and bottom. The hook is then placed over the edge of the barrel and the wheels allowed to roll back until the tongue slips under the lower edge of the chime. Pushing the wheels up to the load by means of the handle and the pedal raises the attached load from the floor. Load is then tipped to balancing position and is easily moved.



Wheels are 10 in. diameter by 3 in. wide and are mounted on roller bearings. Steel, hard rubber or pneumatic tires can be furnished. Over-all width of truck is 25 in. It is claimed that one man can pick up and transport loads up to 900 lb. and that the design is suited for operation in restricted spaces.



Lovejoy Type WQ Flexible Coupling

One set of jaws, made in the form of a removable ring, is used in the L-R Type WQ flexible coupling announced by The Lovejoy Flexible Coupling Co., 4956 West Lake St., Chicago, Ill. This ring is held in place and driven by three, five, seven or nine hexagon-head steel capscrews which operate from the jaw body. The L-R principle of carrying the load on free-floating cushions is retained. These cushions float between the metal jaws and no lubrication is necessary since there are no metal-to-metal contacts between the coupling jaws.

Three types of cushions are used. A "Metalflex" brake lining material is recommended where heavy shop loads develop and where the clutch is to be exposed to severe weather conditions. Leather load cushions are used on sustained loads and permit

increased misalignment. "Multiflex" cushions, a rubber-duck fabric vulcanized under pressure, are employed where loads fluctuate considerably and maximum resiliency is important. Standard sizes, with bores ranging from 1½ to 14 in. and with capacities from 2 to 2,000 hp. at 100 r.p.m., are available.

"Probator" Speed Indicator

A counter and the works of a stop-watch have been combined in the "Probator" speed indicator so that they are simultaneously thrown in and out of gear. This instrument, offered in the United States by Montgomery & Co., Inc., 129 Crosby St., New York, N. Y., has a driving spindle which runs idle so that when the spindle is inserted in the center of the shaft of which the speed is to be measured, the driving spindle is made to revolve but does not start the instrument. Counter and stop-watch will start simultaneously by pressing the instrument strongly against the shaft. Both stop-watch and counter can be read at a glance as soon as the pressure is released. Both are reset to zero simultaneously by one turn of the milled knob at the end of the instrument. Watch is wound for the next test at the same time that it is set to zero. Counter registers to 10,000. A similar counter, not equipped with a stop-watch, is also offered for use with a separate watch.

M.&W. "Speed" Primer

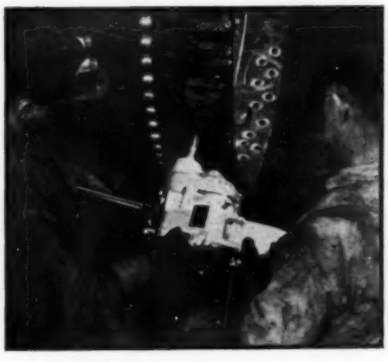
A synthetic primer for use on metal products has been developed by Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J. This "Speed" primer is suitable for use under air-drying lacquer-enamels or baking synthetic enamels, or as a shop coat. It air-dries or can be force dried or baked, giving a flexible schedule ranging from 2 hours at 160 F. to 20 min. at 275 F. Good adhesion is claimed, as are good building and hold-out properties. It is easily sanded. Various colors are available for dipping or spraying.

"Rush Eraser"

"Fiberglass" refills are available for the "Rush-Eraser," offered by The Eraser Co., Inc., 120-14 East Washington St., Syracuse, N. Y. Soft rubber tips for pencil or carbon copy erasures are provided in one end of the holder and the other end is fitted to take the refills. "Fiberglass" refills will remove India ink from tracing cloth and can also be used as a superfine abrasive to polish metal, sand tiny parts, or retouch photographic negatives. It is claimed that "Fiberglass" will remove rust, paint, lacquer, enamel or printing ink.

B. & D. Heavy-Duty High-Cycle Reamer

Designed with the spindle alongside the motor and with the feed screw and tool-bit knock-out arrangement built into the spindle, this high-cycle reamer, announced by The Black & Decker Mfg. Co., Towson, Md., is claimed to be suitable for constant service on heavy-duty drilling and reaming operations in fabricating plants and railway equipment and repair shops.



Armco "Zincgrip" Galvanized Sheet

Produced in both sheets and coils, Armco "Zincgrip" sheets offered by the American Rolling Mill Co., Middletown, Ohio, are claimed to have a heavy coating of commercially pure zinc that will not crack or peel when it is subjected to relatively severe drawing or forming operations. Zincgrip, from 16 to 28 gage, is available in any of the basic grades of galvanized iron or steel sheets and strip. Refrigerator watershed pans have been successfully drawn to a depth of 5 in. without injuring the coating.

Illinois "Alnor" Pyrometer Controller

Designed to control automatically the temperature of heat-treating furnaces, melting pots or other heating devices, the "Alnor" pyrometer controller announced by Illinois Testing Laboratories, Inc., 420 North LaSalle St., Chicago, Ill., operates on an electronic principle similar to a radio circuit. Pointer of the indicating pyrometer carries a small vane, and an adjustable target carries two condenser plates or vanes. These vanes are the capacitive element.

When the temperature pointer with its vane approaches the temperature setting, the vanes of the pointer and target interleave and produce a circuit change which, in turn, operates a relay. No motor or depressor bar is used in this controller. The temperature indicating pointer is free to give continuous indication and control. A red bull's eye indicates whether the heat in the furnace is on or off.

After 50—What Then?

W. R. NEEDHAM
Stychfield, Stafford, England

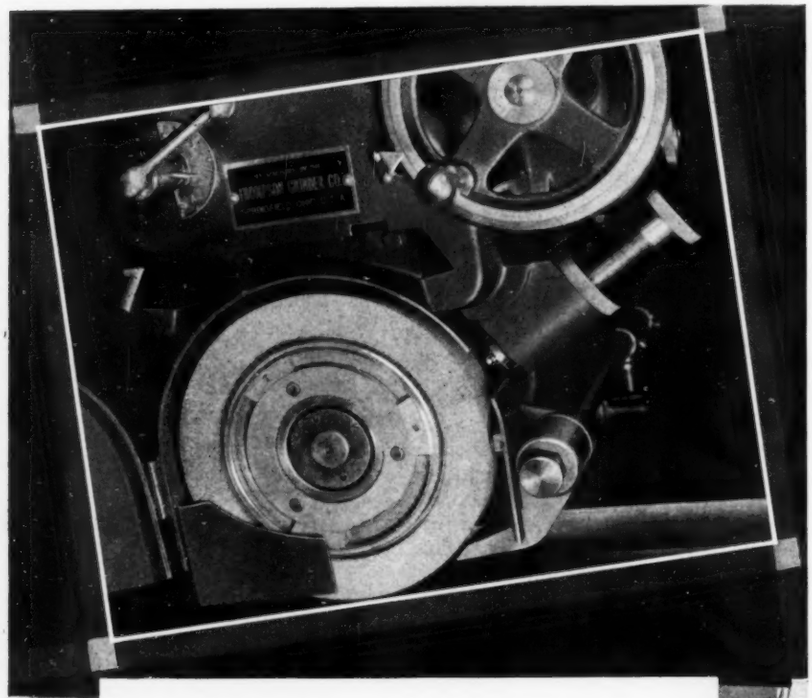
Men over fifty, or nearing that mark, are most likely to be interested in articles such as that by Roger C. Dickey with the above title, (*AM*—Vol. 81, page 637). All men, whatever their present reactions to such questions, are definitely heading for the time when this topic will be of vital importance.

Many a youth is today given six to twelve months of specialized training in a particular field and forthwith designates himself as a "specialist." No matter how apt a pupil he may have been, all this cannot compensate him or his employers for the lack of wider experience so essential to a balanced and well-informed service. When put up against anything outside of the narrow limits of his particular training, he cannot equal the man who has acquired skill and experience under the old apprentice system. Versatility and aptitude are most often the result of close and prolonged application.

None will deny that the young bloods, however intolerant of "old fossils" still find their own particular "dad" a useful standby. Withdraw the older generation too early from employment and these youngsters will suffer with them the consequences of such a foolish policy.

If it could be proved that physical and mental powers show a marked decline after a man reaches forty there might be some economic justification for the replacement of early middle age by youth. Apart from humane considerations, plant after plant would do itself grievous harm if it were to fire all men over sixty, let alone fifty or forty.

On the sound foundation of services rendered, middle age has little difficulty in demonstrating that it can give as much or more for value received as is possible from any other group.



GET OUT YOUR PENCIL

While there are several notable features on the Thompson grinder, one in particular stands out . . . the way the wheel is trued.

Every time the wheel moves to its rear position it passes the sizing diamond and is automatically redressed. Not even a fraction of a second is lost.

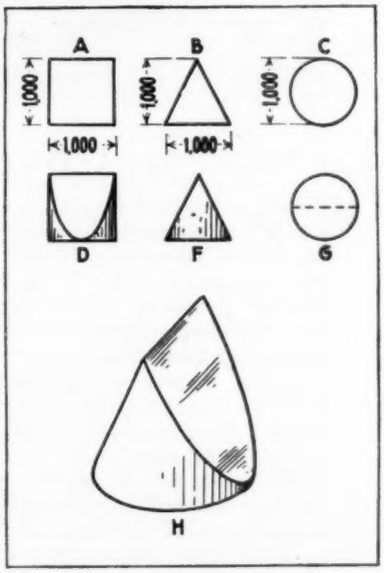
Compare the Thompson **time saving** wheel-truing method with the way wheels are redressed on other grinders. Get out your pencil and estimate the superiority of the Thompson way over ways that slow the work and retard production.

THE THOMPSON GRINDER COMPANY
SPRINGFIELD, OHIO

THOMPSON

One Gage for Three Holes?

H. G. Schrolucke raised the problem (*AM*—Vol. 81, page 598) of designing one gage exactly 1 in. long that will fit holes *A, B* and *C*. The solution is shown by views *D, F* and *G* of the gage, which is placed in such positions as to indicate how it is used and that it satisfies each condition of the problem. An enlarged perspective drawing of the gage is also shown at *H*. The gage is made of bar 1 in. in diameter by 1 in. long and chisel-shaped to fit hole *B*. Con-



tributors who were successful in solving this problem were: L. C. Blomstrom, J. H. Davis, H. R. Graman, William W. Johnson, Theodore Kruger, J. W. Reynolds, E. J. Sampson, and Emil Wittmann.

What Is the Radius?

Heinz A. Mueller submitted this problem (*AM*—Vol. 81, page 680) in which it was required to find the radius *R* of a dome-like part, Fig. 1. The radius must pass through point *A* and be tangent to radius *r*.

Those who were successful in solving the problem are: Elmer E. Aughenbaugh, Paul F. Frick, C. F. Hetherington, William W. Johnson, A. R. Kligman, Mabel I. Purdum, E. J. Sampson and Emil Wittman.

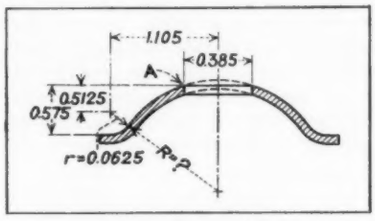


Fig. 1—The problem

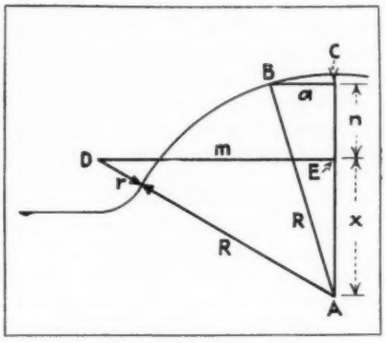


Fig. 2—Method of solution

From triangle *ABC*, Fig. 2:

$$R^2 - a^2 = (x + n)^2$$

$$x = \sqrt{R^2 - a^2} - n \qquad (1)$$

From triangle *ADE*

$$(R + r)^2 = x^2 + m^2$$

$$x = \sqrt{(R + r)^2 - m^2} \qquad (2)$$

Then by setting (1) equal to (2)

$$\sqrt{R^2 - a^2} - n = \sqrt{(R + r)^2 - m^2}$$

Squaring and simplifying

$$R^2 - a^2 - 2n\sqrt{R^2 - a^2} + n^2 = R^2 + 2Rr + r^2 - m^2$$

$$2Rr + r^2 - m^2 + a^2 + 2n\sqrt{R^2 - a^2} - n^2 = 0$$

Substituting values of $a = 0.1925$, $r = 0.0625$, $m = 1.105$ and $n = 0.5125$

$$0.125R + 0.0039 - 1.221 - 0.2627 + 0.0370 + 1.025\sqrt{R^2 - 0.0370} = 0$$

$$0.1250R - 1.443 + 1.025\sqrt{R^2 - 0.0370} = 0$$

$$1.025\sqrt{R^2 - 0.0370} = 1.443 - 0.125R$$

Square both sides

$$1.050R^2 - 0.0388 = 2.082 - 0.360R + 0.0156R^2$$

$$1.0344R^2 + 0.360R = 2.1208$$

Divide through by 1.0344

$$R^2 + 0.348R = 2.050$$

Add $\overline{0.174}^2$ to both sides

$$R + 0.348R + .\overline{174}^2 = 2.050 + \overline{0.174}^2$$

$$(R + 0.174)^2 = 2.080$$

$$R = \sqrt{2.080} - 0.174$$

$$= 1.268$$

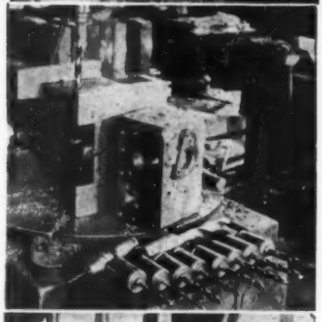
Foreman Training

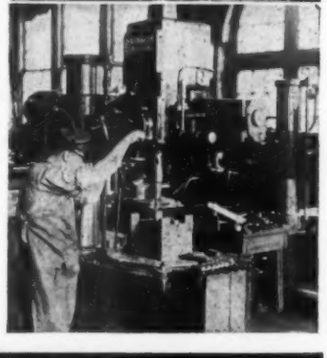
Who are these men we propose to train? What are the present qualifications and what the past training of the average industrial foreman? Or of the individual who may become a foreman in an industry? Where do they come from and how do they attain foremanship?

The great majority of foremen in our plants have come up from the ranks, through successive steps, to their present position, and this is

SUPER-SERVICE RADIALS

The First Three Led To 12 More High-Speed Super-Service Radials





● These views show a few of the 15 High-Speed, All-Geared Super-Service Radials recently installed by a nationally-known manufacturer, whose work includes a variety of jobs like the one shown in the center photograph. Operations in sequence are as follows: Drilling —six 9/16″, seven 13/32″, one 7/16″, one 3/8″, one 15/16″, one 29/64″, one 21/64″, one 3/16″, one 1/2″, one 1/4″, two 1/8″—23 HOLES PER PIECE IN ELEVEN DIFFERENT SIZES. In addition, eight holes are tapped. Ability to change over quickly in order to handle a wide range of hole sizes economically on Super-Service Radials make their use particularly advantageous. Their speed and ease of handling will inspire your operators.

Ask our engineers to show you all the benefits of these modern machines.

THE CINCINNATI BICKFORD TOOL CO., OAKLEY, CINCINNATI, OHIO

CINCINNATI BICKFORD

as it should be. If we fail to recognize ability, we will cease to attract it. They were selected for the most part, however, because of one specific qualification—skill and knowledge of the particular work to be done in the department for which they were chosen—again as it should be. The problem confronting management and foremen alike is—how are these men to know the full requirements of their new position and how to meet them?

Since management alone can know all these problems it is obviously its job to show foremen the full responsibility that is theirs, provide the necessary authority to meet the responsibility, prescribe policies competent to the need, and to train foremen in meeting their responsibilities, using their authority and executing policies.

Stated broadly there are two major responsibilities of foremanship: one, getting out the product; two, handling people.

In getting out the product the foreman should be responsible for: maintaining quality; costs, direct and indirect; maintenance of schedules; condition of plant and equipment; order and cleanliness; safety; economy.

We believe that the average foreman, selected largely for skill in performance, will neither recognize his responsibilities nor know fully how to meet them.

Rigid inspection may guarantee quality to your customer. Inspection, however, cannot always safeguard quality, and too often does so only at the cost of rejected product. Intelligent instruction and proper supervision during processing is the only safeguard to quality. Unless the foreman in charge knows the standard of quality desired, the service requirements of the product, the physical properties and limitations of the materials used, accepts the responsibility and is constantly alert to maintain quality, you will not secure results. The proper instruction and supervision of workers is one on which most foremen need training.

Unless your foreman understands costs, knows the relation of direct labor, indirect labor, supplies, maintenance of equipment, spoilage of material and many other items directly affecting final costs, he will not be in a position to intelligently control costs. His training previous to foremanship has as a rule not provided such knowledge.

Planning Essential

Proper planning of plant and departmental activities is essential to economic operation. The best efforts of planning departments can, however, avail little unless the foreman in charge knows the requirements to be met, the capacities and abilities of his men and machinery and is able to plan his work and execute his plan intelligently.

The foreman of an average department in modern industry is in charge of machinery, tools and equipment representing many thousands of dollars of investment. The manner in which such equipment is used, instructions to operators, supervision of its use, decisions as to when and how to repair, or alter, will materially affect the maintenance cost and the inventory value of such equipment. The average foreman needs definite help from management in meeting these responsibilities.

Good products are not made in dirty disorderly shops. Cleanliness and orderliness are essential to the

HIGH in
• cutting quality
• stability
• anti-rust value
Stuart's
"KLEEN-KUT"
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SOLUBLE CUTTING OIL
Phone or write today for Free Working Sample of this low priced modern soluble oil.
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Warehouses in Principal Industrial Centers

economic production of quality goods. It is vital that your foreman recognize this and maintain proper conditions, yet his path to foremanship rarely provides such knowledge or training.

A foreman should assume full responsibility for safety in his department. He will need the proper support of management through a good policy of safe equipment and working conditions and authority to enforce proper safety rules; but unless the foreman has these things, accepts his responsibility, trains his workers in safety, you will not have a safe shop regardless of safety programs and safety directors.

The general business management and economic operation of any department is a responsibility of the foreman. Proper methods, elimination of waste, of time, materials, supplies and services, all depend on intelligent planning, instruction and supervision by the foreman, a man, whom we have seen, comes to this position in the first place largely because of his personal skill and not by reason of previous training to meet these requirements.

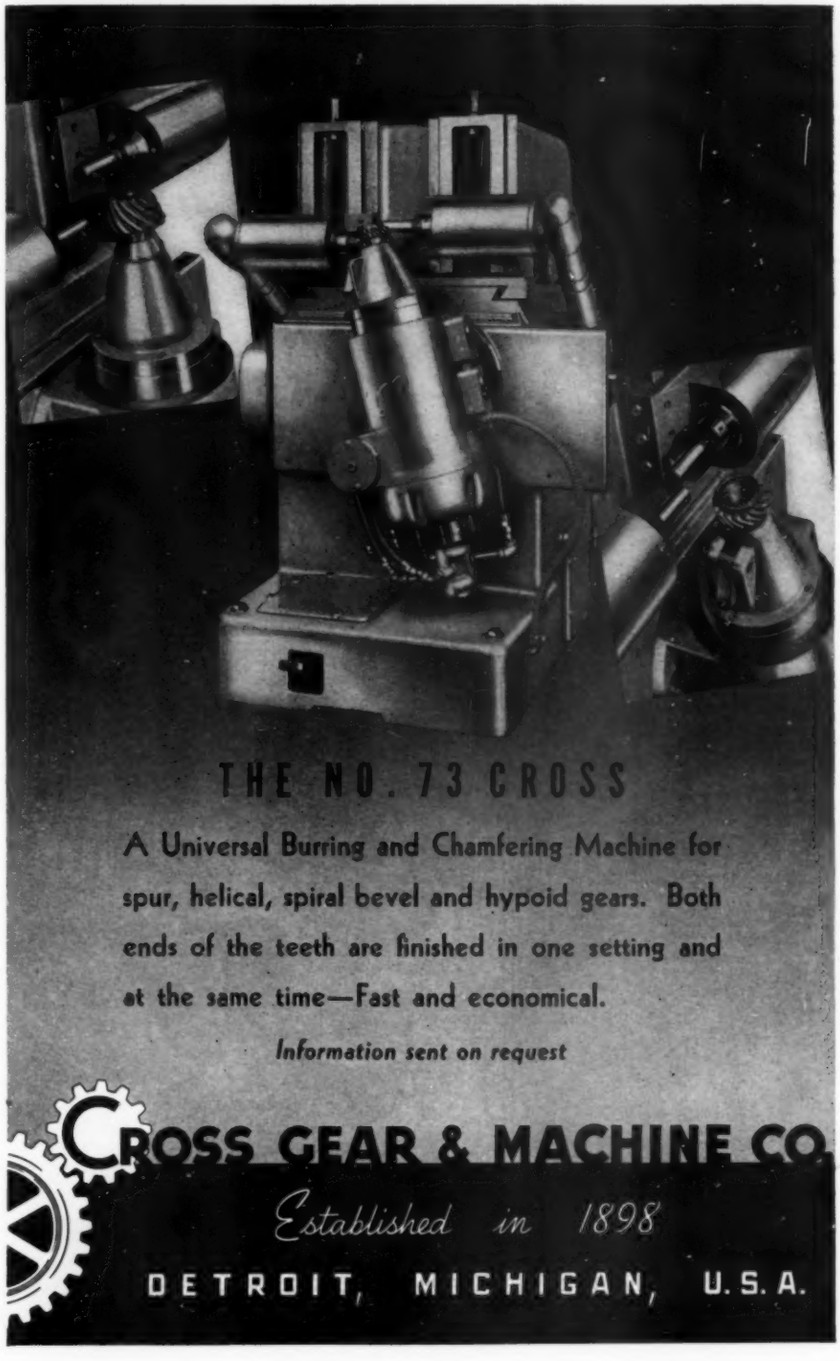
Harmony Needed

In view of all that has occurred in recent months, it requires considerable faith yet to maintain that definite benefits may be derived from a proper technique in training and handling working groups. We have all seen radical reaction in many groups where wages, working conditions, hours and general treatment were of the best. We venture the prediction, however, that as the present hysteria subsides, as it will, the value of such relations will still be evident and the assertion that where proper conditions and relations had not prevailed prior to any disturbance, that now is the time to cultivate them. Profitable production is not possible unless harmony, cooperation and mutual confidence can be restored.

The constant growth in size of plants and departments, removing top management further and further from individual contacts; the gradual elimination of tradesmen, and the substitution of specialists on specific operations, or on special machines; the breakdown of apprentice training and the resulting shortage of skilled artisans in operations still requiring such classes of help; the influence of external groups, bringing through propaganda and false hopes and promises pressure that the average group can neither analyze or resist—all these and many more influences are tending to break down mutual confidence and the understanding of mutual interest that must exist if our industrial progress is to be maintained.

The one man in modern industry today who is strategically placed to best combat all these influences is unfortunately not equipped to meet his responsibilities. Management, either because it has not recognized the value that foremen should have in this direction, or because of lack of confidence in the foreman group, has failed to properly use him. Only his own management can train and educate him, establish policies for him and determine whether or not he is worthy of confidence. Even if such training is provided, your foreman must have a background of proper relations with his group or he will not be able to secure the desired results.

Among those things which are necessary for the development of confidence and loyalty on the part of those who work under the fore-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A Universal Burring and Chamfering Machine for spur, helical, spiral bevel and hypoid gears. Both ends of the teeth are finished in one setting and at the same time—Fast and economical.
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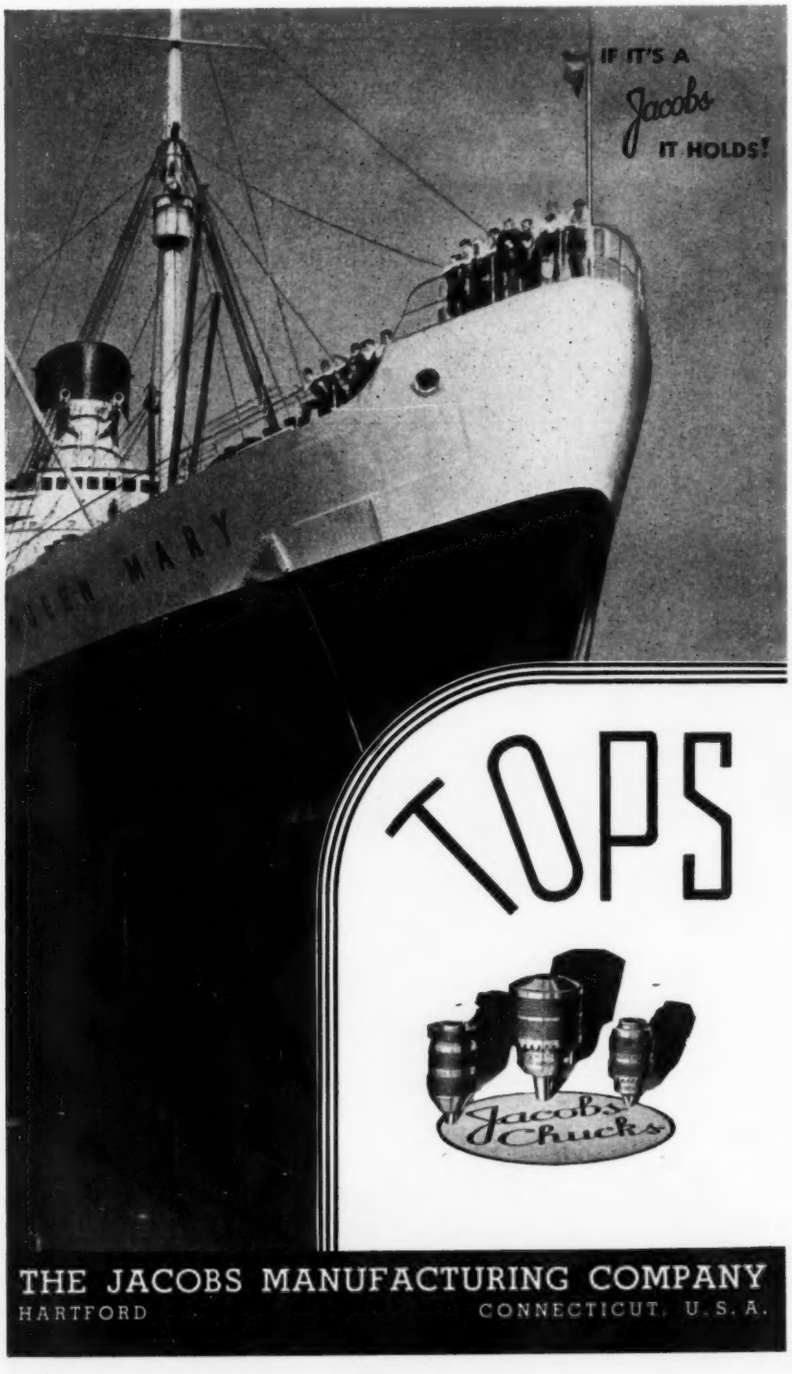
DETROIT, MICHIGAN, U.S.A.

man's supervision is the foreman's ability to place men according to their capacities and abilities, give proper instructions in a proper manner, manage individual workers according to their temperament, delegate responsibility and authority correctly and supervise them properly, set a proper example for his people, compensate fairly and proportionately, make management policies effective to the worker, secure and hold the friendship and respect of his group.

It is the responsibility of the foreman, within his department to know the capacities, abilities and interests of his people, to delegate work so far as possible in keeping with his knowledge, and in fairness to both worker and company, transfer or eliminate those who are not interested in, nor fitted for, the work they are doing. Every individual who is not happy or successful in his work, if allowed to remain, is fertile soil for propaganda and false theories.



Lack of proper instructions is a major cause of defective work and is responsible for a large percentage of manufacturing losses. A foreman should know the job sufficiently well that he can give any necessary instructions, but above all he must know his workers so that he may give to each the kind and type of instructions he needs and will understand. This being true, the foreman must study two things: (1) the proper method of handling each individual; and (2) the effect of his own personality on the worker. Criticism and correction must be given when deserved, but in a proper manner, as also should commendation and praise when merited. The foreman should set a proper example for the people working under him and must observe rules which he expects others to observe. Nor should he indulge in loose talk or criticism of policies. He should be agreeable and friendly with his people but never to the extent that he may lose his authority.

Incentives Help

Piece work or other wage incentive plans based on a proper study of operations and fairly fixed to permit good earnings for real application, then guaranteed against changes except as warranted by changes in design, machines, tools or methods, will do much to help the foreman solve his compensation problem.

Foreman training has for the most part been carried on through the medium of foreman's clubs which are of two distinct kinds: a plant club, enrolling foremen of one plant; city or community clubs enrolling foremen from several plants. The latter are usually organized when foremen as a group seek better equipment for themselves in order that they might maintain or improve their position. They are also of value in the community where the several plants are small in size. It is the writer's firm belief that foreman training in each plant is a problem for and duty of the management of the plant. It is also our belief that proper leadership in this field will do more to solve our operating problems than any other activity to which management might devote a part of its time and effort.

If you have certain foremen who need further technical training in order to meet the present requirements of their jobs, or to keep pace with progress in the art, you may provide this to them as individuals, or direct them to courses available in extension schools or correspond-

ence courses. If they are deficient in such technical knowledge, yet worthy of their position, they will follow such courses of study as may be outlined for them. It will not be good policy to require an entire group to follow a course of technical training directly beneficial to only a part of the group.

For best results the group should include all foremen, assistant foremen, instructors, and any others having supervisory authority over people and products. The group should be organized and officers elected and all meetings should be conducted according to parliamentary rules. Meetings should be held outside regular working hours; the training program should include all personnel already listed.

Meetings at the start should be conducted by the executives—preferably the general manager or factory manager, or by some one delegated by them so directly that his leadership may be authoritative. The program from the start should be one of education in the business facts and policies of the company. After this phase has been completed, subexecutives should in turn explain the policies and methods of their department and provide all facts relative to that work. After this has been completed the club is ready to become actually a "foreman's club." Use the daily problems of your plant as subject matter and your foremen as speakers or conference leaders in round-table discussions.

Abstract of paper presented by A. D. Lynch, manager, industrial relations, J. I. Case Co., before the 41st annual convention of the American Foundrymen's Association, Milwaukee, May 6, 1937.

Data on Machinery and Vehicle Imports

Interesting statistics regarding the importation by the United States in 1936 of machinery and vehicles valued at $5,122,000, which entered free of duty, and $13,624,000, which were on the dutiable list, are contained in Volume 3 just issued by the United States Tariff Commission in a series of four volumes entitled "Imports into the United States for Consumption, by Countries, for the Calendar Year 1936."

The value of the imports, the commission says, is determined, in general, as the foreign wholesale value converted into currency of the United States at the rate of exchange prevailing on the day the merchandise was shipped to the United States.

Largest class of imports in the electrical line in 1936, the volume shows was of miniature metal filament incandescent electric lamps, of which 117,254,890 were imported, valued at $653,273, and all of which came from Japan with the exception of 2,000, valued at $168 which came from Germany. The duty on the lamps was twenty per cent.

Only 5,132 electric vacuum cleaners were imported, valued at $67,994, paying a duty of 35 per cent ad valorem, and coming chiefly from Germany, the United Kingdom and Sweden. Imports of other electrical office and household appliances are shown to have been comparatively negligible. Imports of X-ray tubes, apparatus, and parts, paid a duty of 17½ per cent after February 1, 1936, effective date of the Netherlands Reciprocal Trade Agreement, and were valued at more than $160,000. A footnote relates that Germany, from which was imported more than one-third the total, did not enjoy the new rate because it had ceased to

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enjoy most favored nation treatment after October 15, 1935, and that the old rate of 35 per cent was assessed against these German products.

Three turbines were imported, two from Switzerland and one from the United Kingdom, the three valued at $75,804 and paying a duty of 20 per cent. Imported turbine parts were valued at $42,886.

One hundred and twenty-five Diesel engines, valued at $100,440, and parts, valued at $117,072, paying a duty of 27½ per cent, are shown to have been imported. The completed engines came principally from Germany and the United Kingdom, while nearly half the parts came from Sweden. Fifty-three full fashioned hosiery machines, valued at $342,876, and paying a duty of 40 per cent are shown to have been imported from Germany. Full details are also given for imports of other classes of textile machinery.

Imports of ball bearings and parts are shown to have amounted to 733,344 pounds, valued at $483,492. The rate of duty was eight cents a pound plus 35 per cent ad valorem as fixed by the Swedish Reciprocal Trade Agreement, effective August 5, 1935, though more than half the imports came from Germany and paid at the old rate of ten cents a pound and 45 per cent ad valorem because Germany had ceased to enjoy most favored nation treatment. Imports of roller bearings and parts amounted to 730,144 pounds, valued at $306,447, came from principally Sweden, paying a duty of eight cents a pound and 35 per cent ad valorem as fixed in the Swedish Reciprocal Trade Agreement.

Imports of tobacco machinery and parts amounted in value to $1,031,834, paid a duty of 27½ per cent, and came principally from the United Kingdom and Sweden.

All imports of agricultural machinery and implements were on the free list and accounted for practically all the free list imports in the Tariff Commission's Group 7 category of Machinery and Vehicles. Tractors to the number of 2,374, valued at $1,153,719, and tractor parts, valued at $711,075 are shown to have been imported, principally from the United Kingdom. Other imports of agricultural machinery and implements included; cream separators valued at not over $50 each—23,780, valued at $509,409; plows and cultivators—4,684, valued at $225,519; combines—154, valued at $163,515; headers, harvesters and reapers, n.s.p.f.—569, valued at $110,460; tooth or disk harrows—507, valued at $31,854; drills and planters—448, valued at $46,188; horserakes—106, valued at $3,098; mowers, except lawn mowers—529, valued at $34,838; threshing machines— 33, valued at $24,045; cotton gin—1, valued at $500; sugar machinery and parts—value, $89,794; milking machines and parts—value, $157,444; agricultural wagons and carts—220, valued at $19,342.

Imports of vehicles are shown to have been almost negligible in all classifications. One truck and bus chassis, valued at $8,224, was imported from Canada and paid a duty of 25 percent. Automobiles to the number of 460, valued at $385,898, and paying a duty of 10 per cent, were imported principally from the United Kingdom. No airplanes, seaplanes or amphibians are listed as having been imported. Imports of pleasure boats, motor propelled or otherwise, amounted to 55, valued at $50,144, on which a duty of 30 per cent was paid. Imports of bicycles and parts, except tires, amounted

FAMED JEWELED CROWN OF OUR LADY OF THE ANDES—Fashioned as a thanks offering to the Virgin Mary by the grateful inhabitants of Popayan when that city escaped a dreadful plague in the early 16th Century. Made of pure gold, set with 453 emeralds, the largest of which weighs 45 carats, the crown is valued at $4,500,000 and is considered one of the finest creations of the hand of man through the ages.

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to $343,020 in value and paid a duty of 30 per cent. Imports of motorcycles amounted to 197 in number, valued at $45,483.

Progress in Rate Setting

JAMES W. EMMONS
Standards Department, Bound Brook Oil-Less Bearing Company

A number of the statements made by Gaylord G. Thompson, in his recent discussion of this subject, (*AM* —Vol. 81, page 475), are facts that no one can deny. I cannot, however, agree with Mr. Thompson when he states that time and motion study has, in late years, become a thing of frills and appears bewildering. Why condemn charts, curves and graphs; are they not the result of careful observations and calculations? Observers who gather information for standard time data are generally specially trained men. These specialists know the fundamentals of the various operations and possess the qualifications needed to secure the good-will and cooperation of supervisors and workmen alike.

The establishment of charted standards more nearly approaches consistency than any method I know. Rates set from such standards are fairer and more uniform than those based only on individual studies. Countless time allowances can be set from the blueprints, when using standard data charts, without even seeing the parts or observing the various necessary operations. Operation sheets prepared from standard data assist the operator in the selection of his tools, list the proper machining speeds and feeds and help him in many other ways.

Shrimps Mechanized

Mechanical shrimp peeling has been developed in a plant at Petersburg, Alaska, says a statement by Charles E. Jackson, deputy fisheries commissioner, of the Fisheries Bureau. In telling of this latest development in the sea food business the deputy commissioner explained that the device operates satisfactorily in the plant of its inventor, Earl Ohmer, who plans retaining the device for his own use, and will not market it.

The shrimp is fed by a conveyor belt headfirst into the machine, and the mechanism rips it from end to end, turns it over, lifts off the shell, slices off the head and tail and drops the meat into a container.

British Machine Tool Standard

Dimensions for machine tool elements, including milling machine spindle noses, arbors and adaptors; spindle noses for drilling machines; spindle flanges for combination turret lathes and capstan lathes; and T-slots for milling machine tables, are contained in a standard issued by the British Standards Inst.

Two sizes of steep-taper spindle noses have been included in the new standard, one being smaller and the other one larger than the two sizes standardized in 1931. The four sizes now adopted have external diameters at the large end of $2\frac{5}{16}$ in., $3\frac{1}{2}$ in., $5\frac{1}{16}$ in., and $7\frac{3}{4}$ in., respectively. The same general design has been followed for all sizes, including a taper of $3\frac{1}{2}$ in. per foot. In the case of the small spindle nose, however, the keys are formed integral with the spindle.

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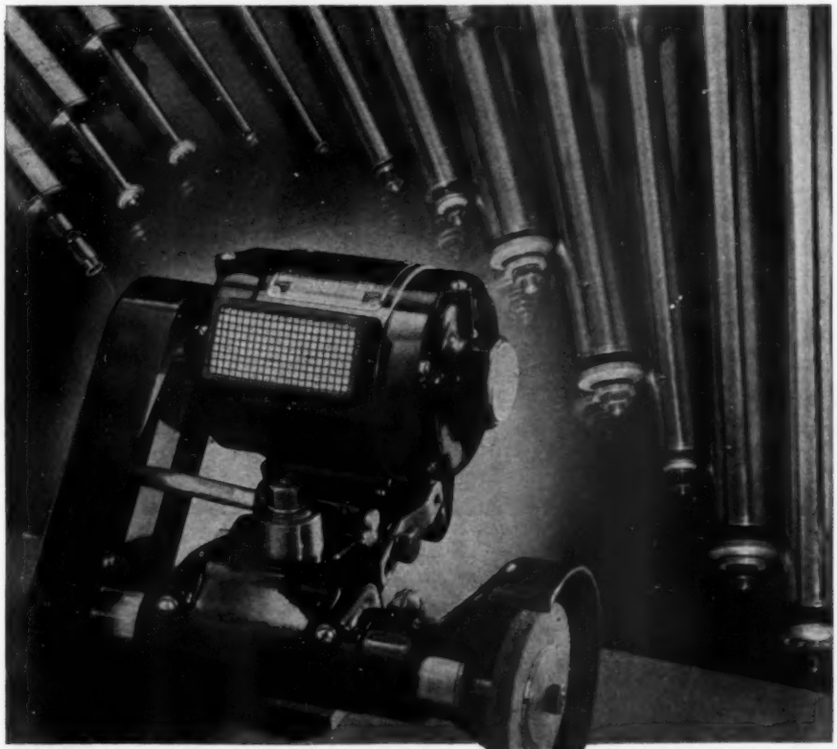

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adapters to accommodate the old-style arbors was based upon American practice, and this form of adapter is now in wide use. The standard recommends that the adapters for the new sizes be made to fit on the taper. In the smallest size, a collar with recesses for the screw heads is used to keep the adapter in place, while in the largest size a draw bolt is used. This lightens the parts to be handled and also makes it easier to assemble the adapter and the old-style arbors.

According to *Industrial Standardization,* the new British Standard, "Dimensions for Machine Tool Elements," No. 739–1937, can be ordered from the American Standards Association, 29 West 39th St., N. Y.

Age Limits in Industry

G. McARDLE

It becomes increasingly difficult to understand the growing tendency among some industries of clearing out older men from shops. The older man stands condemned, because of his age (not old age) to years of uselessness and despair.

National prosperity depends on liberal treatment of the working classes, and Industry progresses by the retaining of seasoned workers, who know the ropes. Young men fresh from training schools need the guidance of maturer minds.

Industry needs the enthusiasm of the young it is true, but benefits more from the saner judgment of older minds. Must those men, then, who should logically manipulate industry, be thrust into the discard because the political economy of labor is undergoing drastic changes? "Time improves our wits as well as wine" says Alexander Pope, and it is a strong argument in favor of keeping the older man employed.

Plato's philosophy could readily be applied with advantage to our present labor conditions, that is, every man working at what he best can do, as long as he can do it, and being raised to his position and retaining it because he is possessed of ability, not because he is under forty.

The Craftsman

FRED H. COLVIN

Down through the ages, since time began
Craftsmen have fashioned the things we need,
Crude perhaps, since the early man
Wanted but little, and gave no heed
To aught but weapons of crude design,
To tools that helped win his daily bread,
Fashioned with little artistic line,
Of wood, or stone, or of bronze instead.

Inventive craftsmen designed machines,
Cunning devices of cams and gears,
Easing the labors, increasing the things
We all could have in the growing years.
Without machines, which the craftsmen build,
Life would be harder, and living bare,
And back of each as it works for all
The craftsman spirit is everywhere.

For the man still counts, as ne'er before,
Without him no progress can e'er be made,
Both he who builds and he who runs
Should look to the future—unafraid.

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RIVETT roller bearing bench lathe equipped with Timken "Zero" precision mirror finish bearings provide the combination of high precision and rapid production required of a modern efficient tool. Every rotating part is dynamically balanced to insure a rigid vibrationless spindle from 100 to 2300 r.p.m. Turning tools capable of high cutting speeds can be used assuring production with work held to extremely close limits. Many manufacturers today are experiencing the production possibilities of the Rivett roller bearing bench lathe. Bulletin 505-RB provides further details.
RIVETT LATHE & GRINDER INC.
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PIONEERS IN BENCH LATHE DEVELOPMENT

New Diesel Drive

Reports of successful trial runs by a new type of diesel-engine-powered locomotive come from the Humbolt-Deutz-Motoren A.G., the largest German makers of diesel engines. It is claimed that the method of operation of the locomotive is entirely new in having direct drive wheels without gears. The machine is reported to have developed 110 km. an hour.

Compressed air from a compressor, operated by auxiliary diesel machinery, is admitted into the cylinders of the locomotive to start the engine. This initial impulse starts pistons, connecting rods, wheels and fuel pumps. The pumps then throw a fine spray of fuel oil into the cylinders. This oil is ignited by electrically heated metal spirals. As soon as the locomotive has gained medium speed, the compressed air is shut off. The locomotive is reported to generate a maximum of 1,000 hp.

NEW BOOKS

ENGINEERING MECHANICS. STATICS. *By S. Timoshenko, Professor of Theoretical and Applied Mechanics, Stanford University, and D. H. Young, Assistant Professor of Engineering Mechanics, University of Michigan. 334 pages, 6x9 in. Illustrated by diagrams. Bound in cloth boards. Published by McGraw-Hill Book Company, Inc., New York and London. Price* $2.75.

As the authors point out in their preface industry today is demanding better grounding of the young engineers it expects to hire, in the fundamentals of engineering at the expense of much of the specialized training thought necessary a generation ago. Industry is constantly called upon to face and solve new problems, ones that are not in the text books. It needs young men trained to visualize such problems, reduce them to their fundamentals and then solve them by applying the principles with which they are familiar. The authors aim to approach the subject of statics in this fashion.

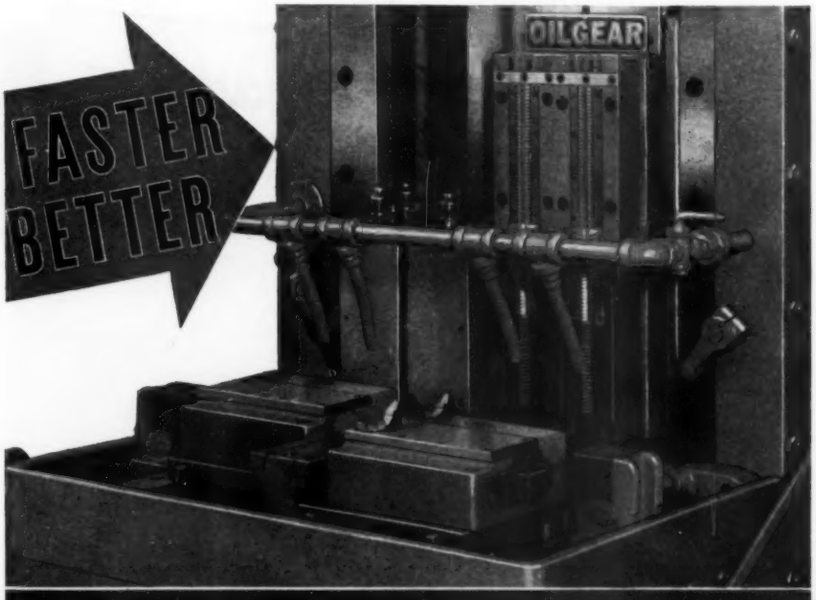
The following subjects are treated in separate chapters: Principles of Statics; Concurrent Forces in a Plane; Parallel Forces in a Plane; General Case of Forces in a Plane; Concurrent Forces in Space; Couples and Parallel Forces in Space; General Case of Forces in Space; Principle of Virtual Displacements.

Each chapter contains solved and unsolved problems, the latter graded according to difficulty. In selecting the problems it has been assumed that the reader or student is familiar with differential but not integral calculus.

MACHINE DESIGN, SECOND EDITION. *By P. H. Hyland, associate professor of machine design, University of Wisconsin, and J. E. Kommers, professor of mechanics, University of Wisconsin. 578 pages, 6x9 in. Clothboard binding. Indexed and illustrated. Published by McGraw-Hill Book Company, 330 West 42nd St., New York, N. Y. Price,* $4.50

This second edition of the authors' textbook originally published in 1929 has been brought up-to-date by a rearrangement of chapters, the deletion of some old material and the addition of new. The revision has been aided by experience gained in classroom use of the book.

Those familar with the original



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volume of Professors Hyland and Kommers will remember that it is not intended as a reference book, but rather as a problem presentation of specific applications which are analyzed to establish fundamental principles. The general field of design is approached by discussions of component parts, such as cams, shafting, bearings and screw fastenings. Attention is also given to shop processes and materials of construction, including such important considerations as friction and lubrication.

MANUAL OF GEAR DESIGN, SECTION 3. *By Earle Buckingham, professor of mechanical engineering, Massachusetts Instute of Technology. 172 pages 8½x11 in. Cloth board binding. Indexed and illustrated. Published by Machinery, 148 Lafayette St., New York, N. Y. Price* $2.50

This volume is a practical working manual for the gear designer as were the preceding Sections 1 and 2. The aim of this series is not to teach the theory of gearing or even to introduce one to the practice of gear design. It is intended rather as a handbook for those who meet gear design in their daily problems and who must have readily at hand the basic data that will aid in their quick solution.

Section 3 deals with helical and spiral gears. It contains mathematical tables required for the solution of gear problems with definitions of terms and standard symbols. The section on helical gear mathematics gives the solution of many general problems in detail including definite examples worked out to illustrate the application. The design of internal helical gears is given with tooth forms produced by standard cutters, together with their application to differential and planetary drives in common use.

The pages are reproduced by the photo off-set process directly from the original manuscript which insures accurate reproduction of the numerous tables and formulas.

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INDUSTRIAL HANDBOOK TO GREAT BRITAIN. *Prepared by The Travel and Industrial Development Association of Great Britain and Ireland, 620 Fifth Ave., New York. 50, 4½x7 in. pages. Paper bound.*

This is the fifth edition of a handbook which has been compiled with the object of giving preliminary information to manufacturers from overseas who are considering the establishment of factories in Great Britain. The booklet includes paragraphs on the size of market, banking and finance, transportation, insurance and a chapter on the routine of establishing a company in Great Britain. Tables in the appendix give averages of weekly wages, time rates, qualifications for preferential tariff treatment and lists of development organizations.

ENGINEERING PROBLEMS MANUAL. *By Forest C. Dana and Elmer H. Willmarth. 314, 5x7½ in. pages. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. Price,* $2.25.

Apparently intended as much as an outline as a schooling in the things that make a good engineer, this book devotes considerable space to the aims of engineering problem courses, and on the establishment of standards which the engineer should follow in his engineering work. Chapters are included on the basic principles and tools which should

be used in solving problems. While not intended as a text book on the various topics the background of trigonometry, analytic geometry, calculus, and of precision methods of computation is sketched in. Having clearly and definitely outlined the standards which an engineer is expected to maintain and having reviewed the basic knowledge which is required for the solution of his problem, the last portion of the book contains some 320 review problems of all types. The book closes with tables of abbreviations, mathematical symbols, mensuration, centroids and second moments of simple shapes, trigometric formulas, lengths, areas, volumes, weights, velocities, accelerations, power, pressures, weights of flat steel, weights of round and square steel, properties of standard structural sections, horsepower, friction tables, functions, logarithms and trigometric functions.

While intended for the student, this book contains material of value to anyone who deals with engineering topics or problems. It will prove to be a convenient handbook, particularly for those who are confronted only occasionally with engineering problems.

HOW TO MAKE ALIGNMENT CHARTS. *By Merrill G. Van Voorhis. 114, 6x9 in. pages, with 78 charts. Cloth binding. Published by McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. Price* $2.50.

We have often wondered what the system was for making the complicated alignment charts, wherein you draw a line from point x on one vertical scale through point y on the second to point z on a third vertical scale. This book gives the answer briefly and clearly. Major stress is placed on how to handle the various types of equations. Graphical construction methods are described along with mathematical methods. The aim has been to make the procedure of preparing nomograms as receipe-like as possible so that knowledge of theory is not essential.

The book opens with formulas of the simplest type and progresses to the handling of groups of equations, so that their relation to each other and to certain general type forms becomes clear. By this plan of presentation, the material is gathered together to build a theory as contrasted with presentations wherein an all-inclusive theory is traced to its many branches.

MACHINE TOOL OPERATION, PART II, SECOND EDITION. *By Henry E. Burghardt, instructor of machine work, William L. Dickinson High School. 512 pages, 5x7½ in. Cloth board binding. Indexed and illustrated. Published by McGraw-Hill Book Company, 330 West* 42nd *St., New York, N. Y. Price* $2.75.

In this volume the author continues his previous work which dealt with lathes, bench work and work at the forge. Part II is devoted to work performed on the drilling machine, the shaper, the planer and on milling and grinding machines. In addition the volume includes chapters on hydraulic power transmission and the making of spur and bevel gears.

As in Volume I, the author treats his discussion from the standpoint of practical machine set-ups. He gives the functions of the various machines and then tells how they may be operated to best advantage.

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operation have made necessary considerable revision since the first edition appeared in 1922. For instance, the chapter on hydraulic drive of machine tools is entirely new. There is a new discussion of laying out and leveling planer work. The chapters on grinding wheels and grinding operations have been rewritten to include discussion of wheel selection, centerless grinding and hand lapping. Included in the description of milling machine work is data on differential indexing.

STRENGTH OF MATERIALS, THIRD EDITION. *By Alfred Poorman, professor of applied mechanics, Purdue University.* 314 *pages,* 6x9 *in. Clothboard binding. Indexed and illustrated. Published by McGraw Hill Book Company,* 330 *West* 42*nd St., New York, N. Y. Price,* $3.00

New technique in the fabrication of metals has moved Professor Poorman to bring up to date his earlier work on materials. For instance, the great increase in the use of welded construction has resulted in the addition of two articles on welded joints. In addition, the suject matter has been rearranged and reclassified to form a more logical sequence.

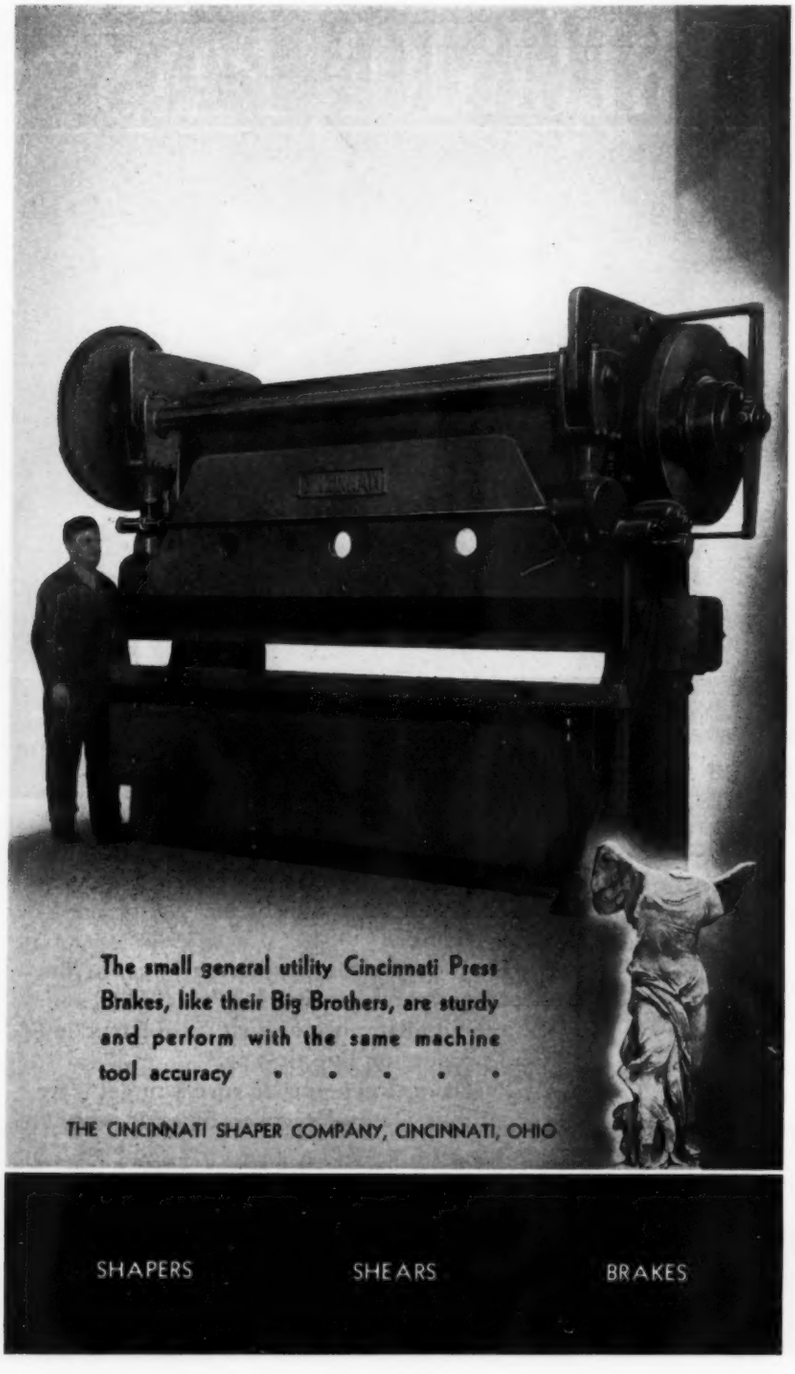
Elastic resilience, which was formerly referred to in several places, is now centered in one chapter. Other articles added are those on shearing stresses, in non-circular shafts, shear centers of channel sections, H-sections with unequal flanges, and angle sections. In nearly all instances entirely new problems have been used with answers given as in the past.

GEAR CUTTING PRACTICE. *By Fred H. Colvin editor,* American Machinist, *and Frank A. Stanley editor,* Western Machinery. 344 *pages,* 6x9 *in. Clothboard binding. Indexed and illustrated. Published by McGraw-Hill Book Company. Price,* $3.00

While this volume gives some information as to the characteristics of the curves commonly used for gear tooth profiles, it treats the subject primarily from the viewpoint of the man charged with shop production of gears. A good nine-tenths of the pages are devoted to cutters and cutting practice including the types of machine tools that are used in gear making. In addition to cutting are included the newer processes of burnishing, shaving, lapping and grinding that are becoming increasingly popular in the production of highly finished tooth profiles. Separate chapters are devoted to heat-treatment and gear inspection.

LEARNING TO READ MECHANICAL DRAWINGS. *By R. A. Bartholomew and S. S. Orr.* 48, 8½x11 *in. pages. The Manual Art Press, Peoria, Ill. Price* 40 *cents.*

The purpose of this book is to teach the fundamental principles of mechanical drawing by having the student work simple problems in freehand or with a very few common drawing tools such as pencil, rule, compass and protractor. Beginning with the fundamental principles of lettering the book continues with explanations and problems on the relation of views in a drawing, the types of drawings, and the fundamental methods of producing such drawings. The book is almost self-contained and is arranged so that many of the problems can be completed on the pages. It has been prepared primarily for use by Junior High School pupils, but may be used in a short course by older pupils.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THE CHEVROLET SIX CAR AND TRUCK. ITS CONSTRUCTION, OPERATION AND REPAIR. *By Victor W. Page. 776 pages, 7½x5 inches. 304 illustrations. Bound in cloth boards. Published by The Norman W. Henley Publishing Co., 2 W. 45th St., New York. Price* $2.50.

Owners, operators and repairmen will find in this book a non-technical treatise on Chevrolet cars and trucks from 1931 to 1937. The mechanical features are described and their operation and maintenance covered in detail. The first few chapters take up the general features of Chevrolet construction while the later ones cover particular models of both standard and master series. Many useful tools are described in the chapter on shop practice.

GASES AND METALS. *By C. J. Smithells, member of the research staff of the General Electric Co., Ltd., Wembley, England. 220, 5½x8½ in. pages. Cloth binding. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York. Price* $4.50.

The behavior of gases and metals in contact with one another is of fundamental importance in many branches of science and industry, and the question is being studied from many points of view by different groups of workers. The author has combined in this one book the results of research in the various branches of the subject and emphasizes the intimate connection between the different phenomena discovered. It is profusely illustrated with charts and diagrams and simply and lucidly explains the fundamentals and general principles underlying the equilibria between gases and metals.

The first section of the book discusses adsorption which is the controlling factor in many catalytic processes, also of great importance in the manufacture of vacuum devices, such as electric lamps, etc. The problems of corrosion also come under this heading.

The second portion of the book is devoted to diffusion. Beginning with early experiments in diffusion of gases through metal the author describes various experimental methods of determining diffusion, discusses the theories, notes the effects of different factors such as thickness, temperature and others. Included are paragraphs on the influence of the surface, composite sheets, and the internal structure of the metal. The book closes with a chapter on the subject of solubility of gas in metals.

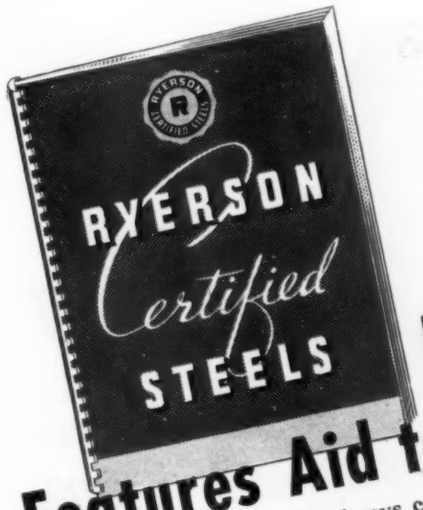
TRADE PUBLICATIONS

ALUMINUM PAINT The Aluminum Co. of America, Pittsburgh, Pa., has prepared a 100-page manual which is intended to serve as a guide for the selection of the proper aluminum paint for any particular service. The manual offers directions for the most efficient methods of mixing and applying it. A chart of finishes and recommendations for handling and storing are included.

CHEMICALS A 32-page booklet, "Quarterly Price List of R&H Chemicals," is offered by The R&H Chemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

CHUCKS A 4-page folder, offered by George Scherr Co., 128 Lafayette St., New York, N. Y., describes Taylor self-centering scroll chucks, which are available in sizes ranging from 4½ to 20 in.

COMPRESSORS "The Motorcompressor" is described in Ingersol-Rand's Bulletin No. 3166. Ad-



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dress Ingersoll-Rand, 11 Broadway, New York, or any branch office.

CONTROL INSTRUMENTS Bulletin No. 462, published by The Bristol Co., Waterbury, Conn., describes temperature recorders and controllers. Pneumatic and electric control valves and the Pyrotrol", for automatically lighting gas-fired ovens and for protection against explosions due to pilot light failure, are described.

FURNACES Carbottom furnaces for general heat-treating purposes are described in Form No. SC-83 announced by Surface Combustion Corp., Toledo, Ohio.

GRINDINGWHEELS Form No. 1223, a folder offered by Norton Co., Worcester, Mass., describes the manner in which the five characteristics of a grinding wheel are identified on Norton wheels.

IMMERSION HEATERS A folder dealing with methods of heating corrosive liquids is available on request from Heil & Co., 3088 West 106th St., Cleveland, Ohio.

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INSULATION A 32-page catalog, Form IN-55 A, containing specific information on all types of sheets, block and pipe insulations has been announced by Johns-Manville, 22 East 40th St., New York, N. Y. Ten pages are devoted to specific recommendations for the insulation of many types of industrial equipment.

INSULATION The 1937-38 edition of the Johns-Manville Industrial Products Catalog has been made available by the company and may be secured by addressing them at 22 E. 40th St., New York, N. Y.

INSULATING MATERIAL "Micabond," a bonded mica insulating material, is described and specifications are supplied in a booklet made available by Continental-Diamond Fibre Co., Newark, Del.

JIG BORER The "Economax" combination drill and jig borer is described on a catalog insert page being mailed by the Fosdick Machine Tool Co., Cincinnati, Ohio.

LIFTING MAGNETS The Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland, Ohio, has issued Bulletin No. 110 describing its improved lifting magnets and magnet controllers for industrial use.

LIGHTING UNITS Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has prepared Catalog Section 61-166 which describes the Millite lighting unit for extreme service conditions in industrial plants.

MULTIPURPOSE GRINDER Typical set-ups possible on the Norton "Multipurpose" hydraulic, universal grinder are illustrated in a 4-page bulletin offered by Norton Co., Worcester, Mass.

NEW TOOLS A 38-page booklet, supplementing Catalogs No. 32 and No. 140, offered by Brown & Sharpe Mfg. Co., Providence, R. I., lists and describes new B. & S. tools, including those tools on which improvements have been made. Items that are no longer available for sale also are listed in this booklet.

OIL PUMPS The "IMO" Rotary Oil Pump designed for supply fuel oils or circulating lubricating oils is described in Publication L-32-10, distributed by the DeLaval Steam Turbine Co., Trenton, N.J.

PYROMETERS Wheelco Instruments Co., 1112-14 Milwaukee Ave., Chicago, Ill., has announced publication of Bulletin o. 503 describing the line of indicating pyrometers and combination pyrometers and switches that are available for industrial purposes.

PUMPS Bulletin No. 6130, offered by Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill., describes a line of duplex power pumps designed for oil field service, fire protection and general service requiring presures up to 800 lb. per sq. in. and capacities to 187 gal. per min.

RADIAL DRILLS A 22-page catalog, No. 31, describing "Economax" hydraulic radial drills, has just been published by the Fosdick Machine tool Co., Cincinnati, Ohio. These radials are available in sizes ranging from 3 to 8 ft.

SAFETY A booklet "Preventing Welding and Cutting Fires," gives safety rules which should be followed for preventing possibility of fires. It may be obtained from The Linde Air Products Co., 205 E. 42nd St., New York, or any of the branch offices.

SENSITIVE DRILLS Three bulletins offered by the Fosdick Machine Tool Co., Cincinnati, Ohio, illustrate and describe various sizes of standard ball-bearing type, sensitive drill press units. Specifications are listed for each size and type.

SPRAY EQUIPMENT A 60-page catalog covering its whole line of spray equipment and finishing equipment has been issued by the Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill.

STEEL Believing that the period embracing the operations from the finishing of the heat, through teeming, solidification and reheating of the ingot to the initial working in the mill, has not been given sufficient attention, a book "The Ingot Phase of Steel Production," has been prepared by the Gathmann Engineering Co., P. O. Box 8, Catonsville, Baltimore, Md. It outlines the relationship between faulty practices in production and the defects in the semi-finished and finished steel products.

TEMPERATURE CONTROL A condensed catalog and price list on heating, ventilating and air conditioning controls has been made available by the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. Also available is a booklet on the "Heat Acceleration" thermostat for stabilizing room temperature.

TOOLS Carboloy Co., Inc., 2989 East Jefferson Ave., Detroit, has issued an illustrated booklet, T-37, which describes in detail a process by which Carboloy users can make Carboloy-tipped tools in their own plants.

TOOL GRINDERS Copies of Catalog No. K-137 may be obtained from Landis Tool Co., Waynesboro, Pa. The catalog describes the Landis 12 in. x 28 in. Universal and Tool Grinder, is profusely illustrated and shows many of the attachments which can be used with this machine.

UPRIGHT DRILLS The Fosdick Machine Tool Co., Cincinnati, Ohio, has announced publication of an 8-page bulletin in which is described the principal features of the "Economax" line of upright drills. These machines are available in 21, 25, and 30-in. sizes.

VALVES A four-page illustrated bulletin describing the Hancock Duravelve which has a leak-proof integral Stellite seat developed for high-pressure, high-temperature service, has been made available by the Hancock Valve Div., Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

VALVES Bulletin 7500-C has been made available by the Hancock Valve Division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn., it gives information on the Hancock "Flocontrol" valves.

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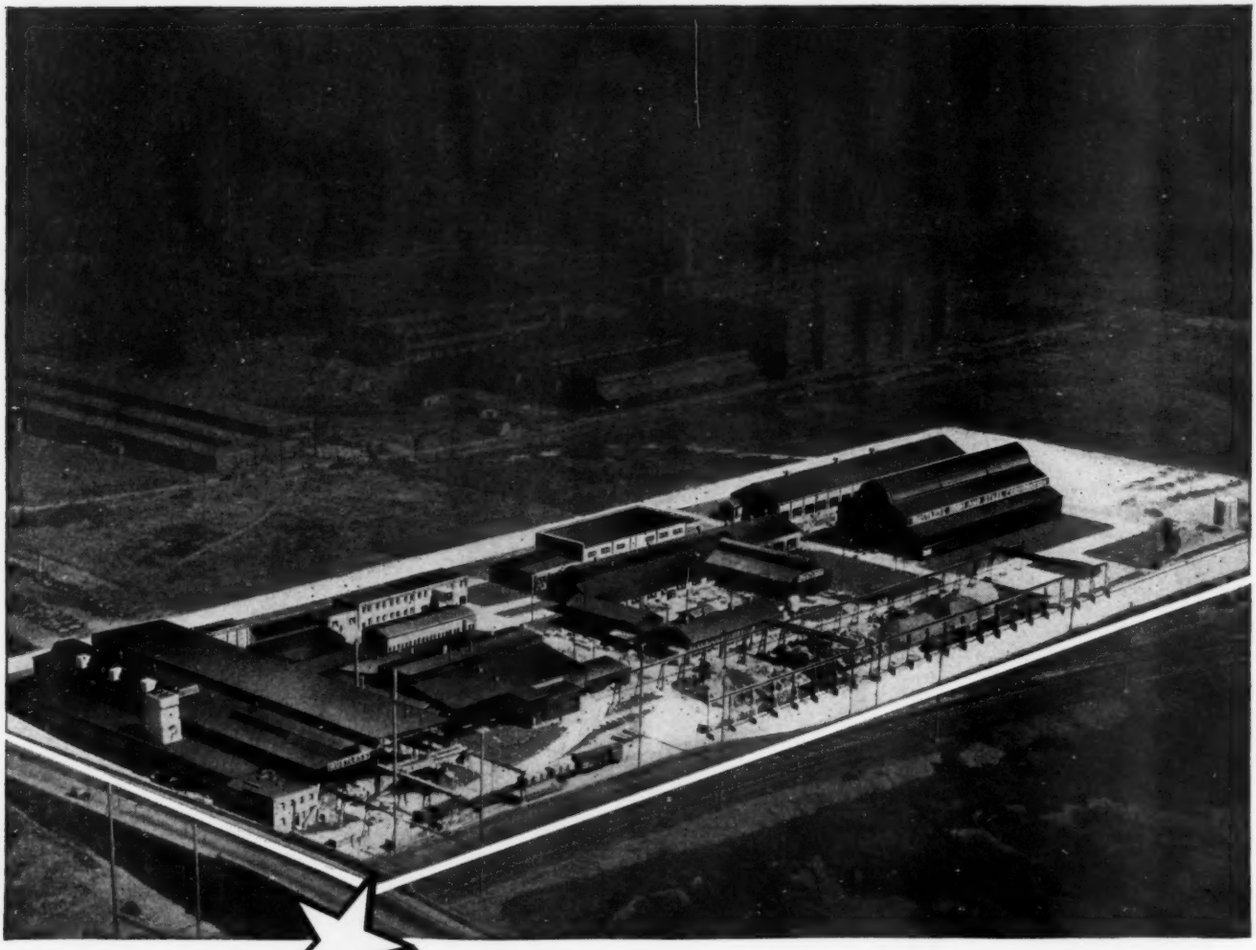

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